Submined to:
US EPA Region 8
Denver, CO

Submitted by:
Atlantic Richfield Company
Anchorage, AK
June 20, 2011

Site Specific Health and Safety Plan

Rico-Argentine Mine Site – Rico Tunnels
Operable Unit OU01
Rico, Colorado

Atlantic Richfield Company

Chuck Stilwell, P.E.
Project Manager

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June 20, 2011

Mr. Steven Way
On-Scene Coordinator
Emergency Response Program (8EPR-SA)
US EPA Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Subject: Site Specific Health & Safety Plan (SSHASP)
Rico-Argentine Mine Site – Rico Tunnels
Operable Unit OU01 Rico, Colorado

Dear Mr. Way,

Please find enclosed three (3) copies of the revised *Site Specific Health & Safety Plan* dated June 20, 2011; in addition, an electronic copy of this document in pdf file format is being submitted via email. Atlantic Richfield is submitting the revised document to respond to comments received from EPA by email dated May 27, 2011, and in accordance with the Removal Action Work Plan, Rico Project – Rico Soils and St. Louis Ponds Rico, Colorado dated March 9, 2011.

If you have any questions, please feel free to contact me at 406.491.1129.

Sincerely,

Chuck Stilwell, P.E.
Project Manager
Atlantic Richfield Company

Enclosures

cc: R. Halsey, AR
S. Dischler, AR
T. Moore, AR
C. Sanchez, Anderson Engineering
T. Kreutz, AECOM (w/o encl.)
D.Yadon, AECOM (w/o encl.)
J. Decker, AECOM (w/o encl.)

RICO PROJECT – RICO SOILS and ST. LOUIS PONDS
Rico, Colorado

SITE SPECIFIC HEALTH & SAFETY PLAN (SSHASP)

Prepared for:

Atlantic Richfield Company
900 E. Benson Blvd.
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Prepared by:

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February 2010
Update: June 2011

SITE SPECIFIC HEALTH & SAFETY PLAN
Rico Project – Rico Soils and St Louis Ponds

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SITE SPECIFIC HEALTH & SAFETY PLAN
Rico Project – Rico Soils and St Louis Ponds

1.0 SCOPE & APPLICABILITY

Policy Statement: It is the policy of Anderson Engineering Company, Inc (AECI) to provide a safe and healthful work environment for all its employees. AECI considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. Every accident and every injury is preventable. AECI will take every reasonable step to reduce the possibility of injury, illness, or accident.

Objective: This Site-Specific Health and Safety Plan (SSHASP) outlines the procedures that must be followed during the execution of this project. Operational changes that could affect the safety or health of personnel, the community, or the environment will not be made without the prior approval of the Project Manager and the Health, Safety and Environmental (HSE) Officer or designee.

The provisions of this plan are mandatory for all contractor personnel assigned to the project.

Approvals

Project Name: Rico Project – Rico Soils and St Louis Ponds
SSHASP Title: Health and Safety Plan, Rico Project – Rico Soils and St Louis Ponds

I have read and approved this SSHASP with respect to project hazards, regulatory requirements, and Contract obligations and procedures.

Christopher Sanchez [signature] 6-17-11
Project Manager Name/Signature Date

Christopher Sanchez, CSP [signature] 6-17-11
Project HSE Officer (or Designee dependent upon project requirements) Name/Signature Date

1.1 Subcontractor to AECI

Any subcontractor(s) to AECI shall provide or prepare their own SSHASP that meets or exceeds requirements of this SSHASP. This document is not a comprehensive safety program. All subcontractors are responsible for the safety of their employees.

In the case that the subcontractor accepts this SSHASP, all workforce members shall review and sign this SSHASP acknowledging that they understand the contents of this document and that they are willing to abide by all safety requirements contained herein as well as all other safety requirements required as part of their respective work.

I accept this SSHASP and plan to abide by all the contents contained therein. I also acknowledge that I am responsible for all other safety requirements that may be associated with completing tasks not contained within this document.

Print Name

Signature Date

1.2 Declaration of Understanding

I have reviewed and understand this Site-Specific Safety and Health Plan (SSHASP) and agree to abide by the procedures and limitations AECI specifies.

Name	Signature	Employer	Employee No.	Date

Notes:
All contractors to AECI must abide by the procedures and limitations contained in this SSHASP.
All contractor personnel working on this task must review and sign this SSHASP before starting fieldwork on site.

References:
This SSHASP complies with applicable Occupational Safety and Health Administration (OSHA) and US Environmental Protection Agency (USEPA) regulations. This SSHASP follows the guidelines established in the following:

- Standard Operating Guidelines (U.S. EPA, June 1992)
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, October 1985)
- Title 29 of the Code of Federal Regulations, Part 1910 and 1926, U.S. Department of Labor/OSHA
- Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices (ACGIH, 1996)
- Safety and Health Requirements Manual (USACE, September 1996)

2.0 KEY PROJECT PERSONNEL & RESPONSIBILITIES

Position	Name	Telephone	Cell
AR Project Manager:	Chuck Stilwell, PE	907-564-4608	406-491-1129
AECI Project Engineer:	Kevin Cosper, PE	972-972-6222	801-756-3427
AECI Project Manager:	C. E. Sanchez, CSP	505-285-6484	801-971-1767
AECI Project HSE Officer:	C. E. Sanchez, CSP	505-285-6484	801-971-1767

2.1 Responsibilities

2.1.1 All Personnel

Each person is responsible for the Health and Safety (H&S) of themselves and their co-workers, for completing tasks in a safe manner and reporting any unsafe acts or conditions to their Supervisor. All personnel are responsible for continuous adherence to these H&S procedures during the performance of their work. No person may work in a manner that conflicts with the intent of the safety and environmental precautions expressed in this SSHASP. AECI reserves the right to dismiss from the site any person who violates safety procedures.

Each person working at the site is to perform work for which they are determined competent. AECI shall receive competency documentation (resume, certifications, etc.) for each individual that will be working at the site. No work shall be completed for which one is not deemed competent.

All site project personnel are required to immediately report any of the following to the AECI Project Manager:

- Accidents and injuries, no matter how minor
- Unexpected or uncontrolled release of chemical substances
- Any symptoms of chemical exposure
- Any symptoms of extreme weather exposure
- Any unsafe or malfunctioning equipment
- Any changes in site conditions which may affect the H&S of the project personnel
- Serious potential incidents (SPI) and near miss incidents

2.1.2 Project Manager/Field Supervisor

The Project Manager/Field Supervisor (PMFS) is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The PMFS is responsible for ensuring all accidents and incidents on the project are reported and thoroughly investigated. The PMFS must approve in writing any revisions to the SSHASP, and is also responsible for the following:

- Enforcing the requirements of the SSHASP. This includes performing daily safety inspections of the work site.
- Stopping work, as required, to ensure personnel safety and protection of property, or where life or property-threatening noncompliance with safety requirements is found.
- Determining and posting routes to capable medical facilities and emergency telephone numbers (including poison control facilities) and arranging emergency transportation to medical facilities.
- Notifying local public emergency officers of the nature of the site operations, and posting of their telephone numbers in an appropriate location.
- Observing on-site project personnel for signs of chemical or physical trauma.
- Ensuring that all site personnel have been given the proper medical clearance, ensuring that all site personnel have met appropriate training requirements, and monitoring all team members to ensure compliance with the SSHASP.

2.1.3 The Project Health, Safety and Environmental Officer

The Project Health, Safety and Environmental Officer (HSE) is responsible for the preparation and modification of this SSHASP. Any changes to the SSHASP must be approved by the HSE Officer. The HSE Officer is the designated regulatory contact on matters related to occupational Health and Safety.

2.1.4 Lower Tier Contractors

On-site lower tier contractors and their personnel are responsible for understanding and complying with all site requirements. Contractors are required to follow the guidelines established in this SSHASP.

2.1.5 Visitors

Site visitors are required to review and acknowledge their understanding of this SSHASP. Site visitors are expected to abide by the requirements of the plan and cooperate with site supervision in ensuring a safe and healthful work site. Site visitors are not to enter the site alone and shall be escorted by qualified site personnel.

3.0 GENERAL PROJECT INFORMATION AND SCOPE

3.1 Project Scope of Work Summary

The Rico project consists of work in and around the Town of Rico Colorado. The St. Louis Mine adit located north of Rico discharges water to a series of settling ponds. There are 13 ponds of various sizes that are connected to flow the mine water through the pond network. The water is retained to allow settlement of metals from the mine discharge. The water is eventually released from the pond network to the Dolores River. The Rico remediation activities consist of monitoring, data collection and pond area work. The work activities are described below

3.1.1 Inspections The ponds are to be inspected on a monthly basis to observe the pond function and pond system condition. Inspections are to identify any problems with the system that may warrant further investigation or correction. The specific inspection items are as follow:

- Embankment Condition
- Pond to Pond Drain System Function
- Spillway Function
- Pond Water Levels
- Minor debris cleared from drains and spillways.

3.1.2 Sampling Surface water is to be sampled at various locations within the St. Louis Ponds and the Dolores River. The sampling is to be completed per the Sampling and Analysis Plan and the Quality Assurance Project Plan. Flow measurements are to be made of adit and pond discharges, pond flows and several points along the Dolores River. Groundwater levels will be monitored at piezometers located at various locations around the St. Louis Ponds. Sampling will be completed on a monthly basis.

3.1.3 Pond Solids Drying Area Construction An area for dewatering and drying of solids removed from the settling ponds will be constructed. The drying areas will be constructed per the construction plan. The drying areas will be enclosed by earthen embankments and the bottom surface graded to drain and collect fluids.

3.1.4 Pond Solids Removal Sediment solids within the St. Louis ponds are to be removed from the upper ponds. The pond solids are to be removed according to the removal plan. Pond solids will be removed using mechanical and or dredge/pump methods. Initial removals will be studied and evaluated for selection of a feasible and effective extraction alternative. Removals will begin with Pond 18.

3.2 SSHASP Scope

This SSHASP has been prepared to address the Scope of Work outline in Section **3.1**, Project Scope of Work Summary. Based on the information herein and current site conditions, this SSHASP will be supplemented with a Risk Assessment, Task Safety Environmental Analysis (TSEA) prepared by the contractor's on-site supervision and project personnel.

3.3 Site Location

The St Louis Site is located north of Rico, Colorado along CO Hwy 145. Latitude/Longitude of general locations will be accessed are below.

Latitude: 108 degrees, 01 min, 44 sec.
Longitude: 37 degrees, 41 min, 47 sec.

3.4 Site History

Mining at the St Louis site began with the St Louis Tunnel by the St. Louis Smelting and Refining Co. during 1930-1331. A major crosscut connected the St Louis tunnel to the Mountain Springs Mine. This resulted in a continuous source of mine water to the Dolores River. The pond system was initially constructed at about the same time. The pond system has been modified and added to over the years. A sulfuric acid plant was built at the St Louis pond area and operated between 1955 and 1964. The Anaconda Co. obtained rights at the St Louis area and conducted exploration drilling from 1980 to 1983. Anaconda also installed a lime plant at the St Louis Site to treat the mine discharge in 1984. Atlantic Richfield Co later acquired the Anaconda Co.; the Rico-area properties including the St. Louis Site were later transferred to Rico Development Co.

4.0 HAZARD EVALUATIONS/RISK ANALYSES

A summary of the principal hazards (including biological, physical, chemical, environmental, etc.) for the anticipated project scope are shown in the following table.

Applicable hazards are checked in the Hazard Analysis table

Yes	No	
x		Blood borne Pathogens (potential bleeding injury)
x		General Physical Hazards
x		Excavation/Trenching (requires separate permit)
x		Heavy Equipment and Machinery
x		Underground Hazards
	x	Crane Operations
	x	Mechanical and Flame-Cutting Equipment
x		Energized Electrical Equipment
x		Access/Egress
x		Noise
x		Housekeeping
x		Material Handling
	x	Drum Handling
	x	Confined Space Entry (requires separate permit)
x		Heat Stress
x		Cold Stress
x (seasonal)		Adverse Weather
x		Vehicular Traffic
	x	Compressed Gases and systems
x(seasonal)		Poisonous Plants
x(seasonal)		Poisonous Snakes and Animals
x(seasonal)		Insect Hazards
x		Water Safety
x		Working on Dredge Barge/Boats/Tug and Shore
x		Chemical Hazards (See attached detailed Chemical Hazard, Pb, Analysis)

A risk based approach has been used to complete hazard analysis. The risk based approach shall be examined to determine the extents of the respective hazards. See Appendix F, Job Hazard Analysis and Risk Assessment.

5.0 EMPLOYEE TRAINING REQUIREMENTS

5.1 Daily Toolbox Meetings

All site personnel shall be required to attend Daily Toolbox Meetings which will be held immediately at the start of each work shift. Toolbox meetings shall be documented on the Daily Toolbox Meeting Record, See Appendix B. Minimum information to be covered in the meeting is as follows:

- Relevant HASP review
- Hazard communication review
- Assessment of the risks of any issues arising from the site walkover and location of on-site equipment and materials
- Planned tasks for the day and hazards associated with those tasks
- Hazard mitigation activities to be performed
- Assignment of specific safety responsibilities
- Review and completion of applicable permit(s)
- Right and obligation to "Stop Work"
- Right and obligation to discuss and ensure proper Management of Change (MoC)
- Review the completed Risk Assessment , TSEAs. The focus should be on how to complete activities on a given site during that work day. The TSEA discussion shall also include identification of "Stop Work" triggers.
- Review of Pb potential exposure
- Other relevant Anderson Defined Practices (ADP) that employees are trained on include PRE, Emergency Procedures, Remote Driving, Working Alone, Communication Plan, Vehicle Inspections, Heat/Cold Stress and Fitness for Duty

5.2 Risk Assessment and Task Safety Environmental Analysis Development and Review

A Risk Assessment (RA) shall be prepared for the Site, Project and Job Phase of the work. The Work Risk Assessment Tool will be utilized. The RA is to be prepared by all entities involved in the work. The RA is to define hazards and mitigations. Risk scores are to be determined for all jobs related to the work. Employees will use the RA to aid in preparation of the Task Safety and Environmental Analysis (TSEA)

A TSEA will be developed for each Task identified in the work plan and as othenvise needed. The TSEA must be completed and approved prior to start of work. See Appendix A for detailed information on TSEA development. The TSEA should be developed and reviewed with all affected site personnel. Whenever a job transfer occurs and when changes in conditions or scope of work necessitate modifications, the TSEA must be updated and reviewed with affected personnel.

The TSEA must comply with the SSHASP and becomes an integral part of the SSHASP when implemented. Maintain TSEA's and the SSHASP in the same location for easy access by all individuals involved in the project.

6.0 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS/ PROTOCOLS & PROCEDURES

6.1 Levels of Protection

Use of Personal Protective Equipment (PPE) is characterized into four major levels which are referred to as Level A, B, C, or D. The definition of each is as follows:

Level A: Provides maximum respiratory protection and skin protection utilizing fully encapsulating suit ensembles, Self Contained Breathing Apparatus (SCBA) and/or Supplied Air Breathing Systems (SABS).

Level B: Provides maximum respiratory protection using SCBA, SABS, or a combination with reduced skin protection. Chemical resistant splash suits are utilized.

Level C: Respiratory protection is reduced using air filtering respirators and appropriate media coupled with outerwear as used in Level B or D. Chemically resistant clothing is often employed.

Level D: Standard work attire for site operations includes Hard Hat worn at ali times, safety glasses-with side shields, steel toed boots, long-sleeve shirt, traffic vest, and appropriate hand protection. Note: When working near water the BP Water Work Policy shall be followed with the appropriate water safety equipment.

All personnel working at the Rico Project at a minimum will be required to comply with Level D PPE. The site PPE is to provide protection of onsite works to physical hazards and potential chemical and biological hazards, those persons working in close contact will metals impacted soils, solids or water will be required to use an upgraded Level D with rubber boots or full water waders, Tyvek coveralls and chemical resistant rubber/latex gloves. The HSE Officer will determine the need to elevate the PPE level and to address respiratory protection for air borne contaminates. The RA attached to this SSHASP will further define PPE use. All employees will be trained in the use and maintenance of PPE. The AECI PPE defined practice will be followed.

7.0 SITE CONTROL MEASURES AND PROCEDURES

7.1 Visitor Information

Visitors to the site shall abide by the following:

- All visitors shall be instructed to stay outside the contamination zone (exclusion and contaminafion reduction zones) and remain within the clean zone during the extent of their stay. Visitors shall be cautioned to avoid all contact with contaminated or suspected contaminated surfaces.
- Visitors requesting to observe work conducted in the exclusion zone (EZ) must meet EZ entry requirements and wear all appropriate PPE, prior to entry into that zone. If respiratory protective devices are necessary, visitors who wish to enter the contaminated zone must produce evidence that they have had a complete physical examination, training, and have been fit-tested for a respirator within the past 12 months.
- Visitor inspection of the contaminated area shall be at the discretion of the Field Supervisor.

7.2 Potable Water

An adequate supply of potable water shall be provided at the work site. Either individual water bottles shall be supplied, or a portable container shall be used to dispense drinking water. If a portable container is used, then the following rules shall be followed:

- Portable containers used to dispense drinking water will be capable of being tightly closed and shall be equipped with a tap dispenser. Water shall not be dipped from the container.
- Containers used for drinking water shall be clearly marked and not used for any other purpose.
- Disposable cups will be supplied; both a sanitary container for unused cups and a receptacle for disposing of used cups shall be provided.

7.3 Non-Potable Water

Outlets for non-potable water shall be identified to clearly indicate that the water is unsafe and is not to be used for drinking, washing, or cooking purposes. There shall be no cross-connection (open or potential) between potable and non-potable water systems. Non-potable and potable water systems shall be separated so as to minimize confusion and possible cross-contamination.

7.4 Toilet Facilities

Temporary toilet facilities shall be available for site workers.

7.5 Log In/Log Out

The Daily Toolbox Meeting Record will serve as the log in/log out sheet and will be maintained at the project Office. Personnel will sign in and out as they enter and leave the project. At the end of the shift, the log will be collected and reviewed for to insure all personnel are accounted for by the Field Supervisor. The log shall be incorporated into project files.

7.6 General Protocols

- Site personnel shall wear, at a minimum, Level D protection (Hard Hat worn at all times, safety glasses-with side shields, steel toed boots, long-sleeve shirt, traffic vest, and appropriate hand protection) whenever working inside the perimeter of the site.
- A fire extinguisher, first aid kit, and eye wash will be available in all vehicles, on all equipment, and easily accessible at each work area.
- Field operations shall cease during thunderstorms, heavy rains, high winds, or heavy snows.
- Snow avalanche hazards exist during the winter season along the east side of the St. Louis Ponds area. DO NOT access this area when deep snow exists on site. Access the site by the east routes along the dike roads.
- Workers will maintain visual contact with equipment operators.
- Drinking water will be provided at the site.
- Personnel will obey all posted traffic regulations.
- Seat belts are to be worn at all times when vehicles are in motion.
- If any H&S concerns change or unexpected site conditions arise which threaten the H&S of personnel, field operations are to be halted and the HSE Officer is to be contacted immediately for evaluation.
- At least one copy of this plan will be available at the Site.
- Ensure that no one is required to lift more than 50 pounds.
- Anyone exposed to falls 6 feet or more must use an appropriate fall protection device and must be trained in its use. Comply with Working at Heights ADP.
- Any person working within 6 ft of water 3 ft deep or a wet condition entrapment hazard shall comply with the Working On Or Near Water Policy (Attached to this SSHASP).
- General outdoor construction areas will be illuminated to a minimum of 3-foot candles. Supplementary lighting may be necessary at night, or in other areas such as first aid stations, administrative areas, etc.
- Employees will inform their partners or fellow team members of non-visible effects of heat stress. The symptoms may include:
    - Headaches/Dizziness
    - Nausea
    - Blurred vision
    - Cramps
    - Irritation of eyes, skin, or respiratory tract
    - Follow Heat Stress ADP
- Employees will inform their partners or fellow team members of the effects of cold stress. The symptoms may include:
    - Headaches/Dizziness
    - Shivering
    - Follow Cold Stress ADP
- Control of hazardous energy and hazardous material sources (Lockout/Tagout) will be adhered to during any activity requiring the isolation of energy or hazardous materials.

8.0 ANDERSON ENGINEERING DEFINED PRACTICES

The Anderson Engineering Co. Inc. Defined Practices (ADP) provide specific information and actions for addressing safety issues and hazards. The ADPs are to be available on site and are included to this SSHASP by reference. All onsite employees will be trained as appropriate on the ADPs. Competency of employees will be verified. The ADPs that are applicable to this project include the following:

- Communication Plan
- Daily Tool Box Meetings
- Driving Safety
- Emergency Response
- Lifting Operations
- LOTO
- Excavation and Ground Disturbance
- Fitness for Duty
- Heat and Cold Stress
- Heavy Equipment and Vehicle Safety
- Hazard Communication
- Overhead Power-lines
- PPE and Respiratory Protection
- Scoping Document - Pennits
- SIMOPS
- Stop Work
- TSEA

9.0 EMERGENCY RESPONSE/CONTINGENCY PLANS

9.1 Discovery and Procedures

If a project employee discovers a spill, fire or injury the following steps shall be taken.

- Assess the situation as to hazards prior to approaching the scene;
- Determine the need for assistance;
- Contact emergency services as required - **911**;
- Contact Field Supervisor
- AECI Project Manager
- AECI HSE Officer
- Remediation Management (RM) Contact
- Field Supervisor shall take appropriate measures to stabilize the scene.

9.2 Emergency Contacts and Actions

State Police: Contact **911** or

Emergency – Contact **911**
Non-emergency **911**
Actions: Describe situation and need for assistance.

Fire: Contact **911**
Actions: Use fire extinguisher if it is safe to do so.

Explosion: Contact 911
Actions: Evacuate area to muster area and account for all personnel. Muster at St Louis entry gate.

Ambulance: Contact 911 or Contact
Actions: Assess nature and seriousness of injury. Administer first aid/ CPR as necessary.

Hospital: Contact 911 / 970-565-6666 (Cortez)

Southwest Medical Center
1311 N. Mildred Rd, Cortez CO
970-565-6666

Alternate
Hospital: Telluride Medical Center,
500 West Pacific Ave, Telluride, CO
970-728-3848.

Injury: Contact 911
Actions: Assess nature and seriousness of injury. Administer first aid as necessary.

Weather: www.weather.gov – internet or tune radio to frequency in area –
Actions: Halt activities and seek shelter during thunderstorms, tornadoes, high winds, snowstorms, etc.

Colorado Emergency Management: Contact (970) 677-2257

Dolores County Sheriff's Office: Contact (970) 677-2257, Emergency 911
Actions: Assess nature and seriousness of incident or condition.

Spill: Contact 911
Actions: Contain spill within immediate area if it is safe to do so and contact HAZMAT
Team: Rico Fire Department 972-967-2861
Dolores County Fire Dept 972-882-4096

Environmental Protection Agency (EPA)
Release of hazardous materials and /or substance
Contact a Region 8 OSC (303) 293-1788

Depending on the quantity of the release as defined in the requirements under the NCP, a call to the National Response Center at 1-800-424-8802 may be necessary

Federal Emergency Management Agency (FEMA)
Contact FEMA when large-scale natural or manmade disasters occur such as earthquakes, floods, forest fires, terrorist attack, etc. (800) 621-3362

U.S. National Response Center
Spills that exceed reportable quantities (800) 424-8802

State Agency (ies)
Colorado Department of Public Health and Environment 303.692.2000 or
Toll Free 1.800.886.7689

OSHA
To report accidents, unsafe working conditions, or safety and health violations.
(800) 321-OSHA (6742) – [National Toll Free Number]

Other Emergency Information: All personnel on site must report any near-miss accident, accident, injury, or illness to their immediate supervisor or the Field Supervisor. Near misses, accidents, incidents, and injuries involving visitors, client representatives, and contractors will be documented in the project files. A detailed report will be submitted to AECI within 24 hours after the accident. An accident investigation will be conducted as soon as emergency conditions no longer exist and first aid and/or emergency medical treatment has been provided.

9.3 Hospitals/ Infirmaries

Southwest Medical Center
1311 N. Mildred Rd, Cortez CO
970-565-6666

Alternative Hospital:
Telluride Medical Center,
500 West Pacific Ave, Telluride, CO
970-728-3848.

9.4 Emergency Equipment On-Site

A fire extinguisher, first aid kit and eye wash bottle will be kept in each piece of equipment and in each work zone at all times.

9.5 Personnel Responsibilities During Emergencies

The HSE Officer will ensure that all necessary emergency equipment is ready for use and will train all personnel in emergency procedures. The HSE Officer will also establish emergency evacuation routes from all locations of the work area. During the daily toolbox safety meeting and prior to beginning work, a staging area will be designated where workers will meet in the event of an evacuation for an emergency.

In case of emergency, The HSE Officer will implement site emergency procedures with consideration for the following:

1. Evaluating the emergency conditions and making recommendations regarding risks to off-site personnel and the public, the necessity of upgrading PPE to protect on-site personnel and emergency responders, and recommending evacuation of on-site personnel;
2. Providing first aid for injured or exposed personnel;
3. Preparing a written accident report for submission to AECI.

All site incidents and accidents that occur in connection to this project will be recorded and reported to AECI.

9.6 Medical Emergencies

Seriously injured or ill personnel should not be moved, unless their lives are endangered, until an assessment has been made by a person trained in first aid and cardiopulmonary resuscitation (CPR). Where the potential exists for the person providing first aid to come into contact with the victim's blood, a protective barrier such as gloves or mouth shield will be used. Emergency medical services can be obtained by calling 911 by telephone, or indirectly, by contacting someone with a telephone by two-way radio.

Any person who becomes ill or injured in the presence of contaminated material must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered before transport. If the person's condition is serious, partial decontamination may be completed (i.e., disrobing the victim and redressing in clean coveralls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take directions to the hospital (map attached) and information on the chemical(s) that person may have been exposed to. The MSDSs for the chemicals on-site are attached to the plan, See Appendix C.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated as necessary. The Medical Case Management ADP will be followed.

9.7 Fire or Explosion

In the event of a fire/explosion, personnel will determine whether the fire is small enough to readily extinguish with immediately available portable extinguishers or water, or if other fire-fighting methods are necessary.

Non-essential personnel will be directed away from the area of the fire.

If a fire is judged to be small enough to fight with available equipment, personnel will attempt to extinguish the fire provided that:

1. They are able to approach the fire from the upwind side, or opposite to the direction of the fire's progress.
2. The correct extinguisher is readily available. (A type ABC fire extinguisher shall be in all equipment.)
3. No known complicating factors are present, such as likelihood of rapid spread, imminent risk of explosion, or gross contamination.

If evacuation is necessary, all personnel will proceed to the pre-designated staging area for a head count and await further instructions for the HSE Officer. The HSE Officer will prepare a written incident report for submission to AECI within 48 hours

9.8 AECI Reporting Requirements

Notification & Reporting Procedures:

Incidents are classified into three basic types: Major (including High Potential Incidents and High Potential Near-Misses), Non-Major, and Near-Miss. When an incident occurs, an incident/near-miss investigation report needs to be completed using the Traction System. The first step is to assess the severity based on the Incident Notification and Reporting Table Definitions (Appendix E, Attachment 1). The initial evaluation determines the appropriate notification.

When an incident occurs, the staff and contractors must notify the appropriate contacts (Appendix E, Attachment 2-Emergency Contact Phone Numbers and Call-out Tree), verbally or via email, as required. The notification often includes an initial Report. Appendix E, Attachment 3 shows the Incident Notification and Reporting Process Table, for notification and reporting requirements. Once the severity is assessed, the Field Supervisor, AECI Project Manager, AECI HSE Officer, and RM Contact are notified as required. Once staff has completed an investigation, a completed report must be submitted. It is at this time that corrective action is recommended and monitored. Appendix E, Attachment 4 – Emergency Summary Information, shows a summary of key phone numbers and parties. Appendix E, Attachment 5 – Hospital Location Map, shows the route to get to the hospital from the Site.

- Whenever a Major Incident or High Potential Incident occurs, the AECI Project Manager and AECI HSE Officer must receive immediate verbal notification, followed by a written report.
- The AECI Salt Lake City Office (1-888-399-2324 or 801-972-6222) is a resource for communications as well as emergency response. If needed, the AECI Salt Lake City Office can be called for notification support on Major Incidents when AECI personnel are not immediately available and when an incident has occurred where the severity is unknown or additional support may be needed.

For all Major Incidents and High Potential Incidents, AECI will contact the Incident Notification Center to assist in notifications.

10.0 SITE CONTROL PROGRAM

This Site Control Program is deigned to minimize the spread of hazardous substances from contaminated areas to areas that have not been contaminated. The Site Control Program is intended to identify and isolate contaminated areas of the site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the site, and to deter vandalism and theft.

The Field Supervisor is responsible for ensuring the Site Control Program is updated as needed.

A site map(s) indicating the site perimeter, entry and exit points, work zones, emergency equipment storage locations, and evacuation routes and places of safe assembly is attached to this HASP.

For the safety of all personnel, access to this site is restricted to only those site workers who have access approval from the Field Supervisor. To further reduce the potential for chemical exposure, site workers shall only enter into zones in which they have access approval from the Field Supervisor.

During hours of site operation, site entry and exit is authorized only at the point(s) identified on the attached Site Map. Entry and exit at these points is controlled by warning signs. During hours that the site is not operating, access to the site is controlled by warning signs and fencing.

For accountability purposes, all site visitors to the site must register with the Field Supervisor. Visitors are required to be escorted. Visitors are expected to comply with the requirements of this HASP. Visitors who will enter contaminated areas of the site must provide adequate documentation that they have the required training and medical evaluation as required by this HASP. Visitors shall receive a site-specific briefing about protecting themselves from site hazards, recognizing site zones, and following emergency evacuation procedures. Visitors shall have the required PPE for the areas that they will visit.

The buddy system should be used for all site workers. The buddy system involves two individuals working together on a project for safety purposes. While working on the buddy system each individual shall be able to maintain visual contact with the other individual. Constant eye contact allows both individuals to be able to respond to the other individual in the case that the person is injured or in need of assistance.

It is discouraged having a single worker onsite. If the situation is needed, the individual shall use an offsite point of contact as their buddy in the buddy system. The single worker shall check-in with their buddy upon arriving onsite, every 2 hours thereafter, and upon leaving the site.

11.0 PERMITS

The AECI/Field Supervisor is responsible for ensuring the completion of the necessary permits for the work to be completed. The permits shall be completed and signed by a competent person as assigned by the Field Supervisor. The pond work will require permits. The inspection and sampling work will not require permits, however all employees shall be briefed on the Working near Water Policy attached to this HASP. All permits will be completed per the Scoping Document Permits ADP and the respective Permit ADP. The Permit ADPs shall be on site and are hereby referenced. The following Permits are expected for the Scope of Work at the Rico Project.

- Excavation and Ground Disturbance
- Overhead Power-lines
- Lifting Operations

Although not a permit, the Working On/Near Water Policy will be complied with. The policy requires that safety training and specific water safety equipment be utilized when working within 6 ft. of water that is 3 ft. deep or a soft bottom exists with a potential entrapment hazard. This policy is attached as Appendix F to this SSHASP.

APPENDIX A

Task Safety Environmental Analysis

Task Safety Environmental Analysis (TSEA) Procedure

1.0 GENERAL INFORMATION

A task safety environmental analysis (TSEA) is a hazard identification technique that involves breaking a job down into basic work elements. Each element is then scrutinized to identify all conditions or activities that could possibly lead to an accident.

A TSEA is a procedure used to review job methods and uncover hazards that: 1) may have been overlooked in the layout of the plant or building and in the design of the machinery, equipment, tools, work stations, and processes; 2) may have developed after production started; or 3) resulted from changes in work procedures or personnel.

A TSEA is an important accident prevention tool that finds and eliminates or minimizes hazards before the job or task is performed. Since employees and supervisors know the jobs the best, it is important that they provide their knowledge and experience about safety and health as they relate to the task or job being analyzed. Some other benefits of a TSEA are:

- Train new employees on jobs they will be performing, or provide refresher training.
- Study jobs for possible improvements in methods or steps, or when they are added or removed.
- Use as a refresher for jobs that are non-routine or performed infrequently.
- Use as an accident investigation tool.
- Most importantly, use as a tool to inform employees of specific job hazards and protective measures to avoid accidents or injuries.

The four basic steps in making a job safety analysis are:

1. Select the job to be analyzed.
2. Break the job down into successive steps or activities and observe how these actions are performed.
3. Identify the hazards and potential accidents.
4. Develop safe job procedures to eliminate the hazards and prevent the potential accidents.

In order to complete a TSEA correctly, all health and safety aspects of the job must be analyzed thoroughly.

Task Safety Environmental Analysis

ANDERSON

Project Description:	
Location:	Prepared by:
Start Date:	Prepared Date:
PPE Reqtdred:	

Activity/Sequence of Job Tasks List all tasks required to perform a job in the sequence in which they are carried out. Note: If a valid and accurate TSEA or SOP already exists in an acceptable format that meets AECI requirements for hazard recognition and participation, note it below and attach to this form and signature page.	Energy or Biological Sources (circle all that apply)	What would be the result of exposure to a biological or energy source? How, where or when could an uncontrolled release or unwanted contact with a biological or energy source occur?	Environmental Impacts Could there be a release to the air, soil, or water? Will a waste be generated?	Management Plan Eliminate - Control - Protect List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental impact. Include identification of Stop Work triggers.	Responsible Party Name of the person responsible for implementation of control measure.
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				

Health & Safety Plan
Rico Project

APPENDIX B

Daily Toolbox Safety Meeting Record

DAILY TOOLBOX MEETING RECORD

Job(s) Location(s) _____ Date: _____

Name of PM or PE: _____

SIMOPS or Multi-Crew Activity? Yes No If yes, describe. SIMOPS _____

Has the SIMOPS work plan been communicated to all workforce? Yes No

Name of SIMOPS PIC: _____ Company: _____

Does the work activity require an MoC?	Yes	No	
If yes, has it been authorized by AM for start-up?	Yes	No	(If No, Stop Work and consult AM.)
Does a valid risk-assessed SOP for this job exist?	Yes	No	
If yes, have person(s) performing work been trained in that procedure?	Yes	No	(If No, conduct TSEA.)

List any safety discussion topics covered: _____

List all jobs to be performed today (Scope of work for day): _____

Identify if there are any permitted activities and document the permit number: _____

Does each job and task have a valid, associated risk assessment assigned to each listed job above?	Yes	No	
Have job and task risk assessments been validated on site?	Yes	No	
Have newly identified risks been documented in the TSEA?	Yes	No	
Has a member of the workforce conducting each task participated in the Risk Assessment for that task?	Yes	No	
Have all members of the workforce confirmed understanding of the work scope, hazards, risk controls and mitigation?	Yes	No	
Was a competent person involved in this or any other risk assessment pertaining to these tasks?	Yes	No	
Has everyone reviewed the current Emergency Response Plan?	Yes	No	
Have equipment checks been completed, documented and reviewed?	Yes	No	N/A

Will any conditions change the muster points for today? Yes No If yes, describe and discuss with crew: _____

_____

Post Daily Review:

Best practice/activity(s) observed: Yes No (If Yes, describe them) _____

_____

Were there any Incidents or First Aid Reports for the day? Yes No (If Yes, name them) _____

_____

Were there any 'Stop Work' interventions? Yes No (If Yes, describe them) _____

_____

Area for Improvement Practice/Activity(s) Observed: Yes No (If Yes, name them) _____

Signature Page

I know the hazards:

By signing here, you are stating the following:

1. You have been involved in the Task Safety Environmental Analysis and understand the hazards and risk control actions associated with each task you are about to perform.
2. You understand the permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
3. You are aware that no tasks or work (that is not risk-assessed) is to be performed.
4. You also are aware of your obligation to 'Stop Work'.

I arrived and departed fit for duty

5. You are physically and mentally fit for duty.
6. You are not under the influence of any type of medication, drugs or alcohol that could affect your ability to work safely.
7. You are aware of your responsibility to bring any illness, injury (regardless of where or when it occurred) or fatigue issue you may have to the attention of the Work Crew Leader.
8. You signed out uninjured unless you have otherwise informed the Work Crew Leader.

SIMOPS NOTE

SIGNATURES ARE REQUIRED BY ALL PERSONS INVOLVED IN A WORK TASK OR WHO MAY BECOME AFFECTED BY A SIMOPS SITUATION.

Individual Name/Company Name/Signature	Initials & Sign In time	Initials & Sign out Time
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit
	In & Fit	Out & Fit

I will STOP the job any time anyone is concerned or uncertain about safety.

I will STOP the job if anyone identifies a hazard or additional mitigation not recorded on the TSEA.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original TSEA.

If it is necessary to STOP THE JOB, I will reassess the task, hazards and mitigations; and then amend the TSEA as needed.

ANDERSON ENGINEERING COMPANY INC.

Names of site visitors not involved in the work activities:

In / Out
In / Out
In / Out
In / Out
In / Out

At the conclusion of the day, I certify that the job site is being left in a safe condition and there were no reports of injury or first aid.

Yes No

Signature of Work Crew Leader

(If above answer is No, inform the PM or PE, when applicable.)

Definitions: Project – A planned set of interrelated jobs to be executed over a period of time. Job – A general activity, including several different tasks that occur when working on a project. Task – One of several potential specific actions that occur as part of the process to complete a job. Hazard – The potential for an uncontrolled release of, or unwanted contact with, a biological or energy source.

Health & Safety Plan
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APPENDIX C

Material Safety Data Sheets

Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

DIESEL FUEL No. 2

Product Use: Fuel
Product Number(s): CPS203410 [See Section 16 for Additional Product Numbers]
Synonyms: 15 S Diesel Fuel 2, Alternative Low Aromatic Diesel (ALAD), Caico LS Diesel 2, Caico ULS DF2, Caico ULS Diesel 2, Chevron LS Diesel 2, Chevron ULS Diesel 2, Diesel Fuel Oil, Diesel Grade No. 2, Diesel No. 2-D S15, Diesel No. 2-D S500, Diesel No. 2-D S5000, Distillates, straight run, Gas Oil, HS Diesel 2, HS Heating Fuel 2, Light Diesel Oil Grade No. 2-D, LS Diesel 2, LS Heating Fuel 2, Marine Diesel, RR Diesel Fuel, Texaco Diesel, Texaco Diesel No. 2, Ultra Low Sulfur Diesel 2

Company Identification
Chevron Products Company
Marketing, MSDS Coordinator
6001 Bollinger Canyon Road
San Ramon, CA 94583
United States of America

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product Information
MSDS Requests: (800) 689-3998
Technical Information: (510) 242-5357

SPECIAL NOTES: This MSDS covers all Chevron and Caico non-CARB Diesel No. 2 Fuels. The sulfur content is less than 0.5% (mass). Red dye is added to non-taxable fuel. (MSDS 6894)

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Diesel Fuel No. 2	68476-34-6	100 %wt/wt
Distillates, hydrodesulfurized, middle	64742-80-9	0 - 100 %wt/wt
Distillates, straight run middle (gas oil, light)	64741-44-2	0 - 100 %wt/wt
Kerosine	8008-20-6	0 - 25 %wt/wt
Kerosine, hydrodesulfurized	64742-81-0	0 - 25 %wt/wt
Distillates (petroleum), light catalytic cracked	64741-59-9	0 - 50 %wt/wt
Naphthalene	91-20-3	0.02 - 0.2 %wt/wt
Total sulfur	None	0 - 0.5 %wt/wt

SECTION 3 HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW

- COMBUSTIBLE LIQUID AND VAPOR
- HARMFUL OR FATAL IF SWALLOWED - MAY CAUSE LUNG DAMAGE IF SWALLOWED
- CAUSES SKIN IRRITATION
- MAY CAUSE CANCER BASED ON ANIMAL DATA
- TOXIC TO AQUATIC ORGANISMS

****

IMMEDIATE HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin causes irritation. Skin contact may cause drying or defatting of the skin. Symptoms may include pain, itching, discoloration, swelling, and blistering. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.

Ingestion: Because of its low viscosity, this material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death. May be irritating to mouth, throat, and stomach. Symptoms may include pain, nausea, vomiting, and diarrhea.

Inhalation: Mists of this material may cause respiratory irritation. Symptoms of respiratory irritation may include coughing and difficulty breathing. Breathing this material at concentrations above the recommended exposure limits may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

DELAYED OR OTHER HEALTH EFFECTS:

Cancer: Prolonged or repeated exposure to this material may cause cancer. Whole diesel engine exhaust has been classified as a Group 2A carcinogen (probably carcinogenic to humans) by the International Agency for Research on Cancer (IARC). Diesel exhaust particulate has been classified as reasonably anticipated to be a human carcinogen in the National Toxicology Program's Ninth Report on Carcinogens. The National Institute of Occupational Safety and Health (NIOSH) has recommended that whole diesel exhaust be regarded as potentially causing cancer. Diesel engine exhaust is known to the State of California to cause cancer. Contains naphthalene, which has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

See Section 11 for additional information. Risk depends on duration and level of exposure.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: Wash skin with water immediately and remove contaminated clothing and shoes. Get medical attention if any symptoms develop. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: If swallowed, get immediate medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.

Inhalation: Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

Note to Physicians: Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis.

SECTION 5 FIRE FIGHTING MEASURES

See Section 7 for proper handling and storage.

FIRE CLASSIFICATION:
OSHA Classification (29 CFR 1910.1200): Combustible liquid.

NFPA RATINGS: Health: 0 Flammability: 2 Reactivity: 0

FLAMMABLE PROPERTIES:
Flashpoint: (Pensky-Martens Closed Cup) 52 °C (125 °F) (Min)
Autoignition: 257 °C (494 °F)
Flammability (Explosive) Limits (% by volume in air): Lower: 0.6 Upper: 4.7

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.
Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 29C (85F).
Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Do not breathe vapor or fumes. Do not breathe mist. Wash thoroughly after handling. Keep out of the reach of children.
Unusual Handling Hazards: WARNING! Do not use as portable heater or appliance fuel. Toxic fumes may accumulate and cause death.
General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by

themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

General Storage Information: DO NOT USE OR STORE near heat, sparks, flames, or hot surfaces .USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: Wear protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted. Suggested materials for protective gloves include: Chlorinated Polyethylene (or Chlorosulfonated Polyethylene), Nitrile Rubber, Polyurethane, Viton.

Respiratory Protection: Determine if airborne concentrations are below the recommended occupational exposure limits for jurisdiction of use. If airborne concentrations are above the acceptable limits, wear an approved respirator that provides adequate protection from this material, such as: Air-Purifying Respirator for Organic Vapors.

When used as a fuel, this material can produce carbon monoxide in the exhaust. Determine if airborne concentrations are below the occupational exposure limit for carbon monoxide. If not, wear an approved positive-pressure air-supplying respirator.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Agency	TWA	STEL	Ceiling	Notation
Diesel Fuel No. 2	ACGIH	100 mg/m3	--	--	Skin A3 total hydrocarbon
Diesel Fuel No. 2	CVX	--	1000 mg/m3	--	--
Kerosine	ACGIH	200 mg/m3	--	--	Skin A3 Total hydrocarbon vapor
Kerosine	CVX	--	1000 mg/m3	--	--
Kerosine, hydrodesulfurized	ACGIH	200 mg/m3	--	--	Skin A3 Total hydrocarbon vapor
Kerosine, hydrodesulfurized	CVX	--	1000 mg/m3	--	--
Naphthalene	ACGIH	10 ppm (weight)	15 ppm (weight)	--	Skin
Naphthalene	OSHA Z-1	50 mg/m3	--	--	--

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Varies depending on specification
Physical State: Liquid
Odor: Petroleum odor
pH: Not Applicable
Vapor Pressure: 0.04 kPa (Approximate) @ 40 °C (104 °F)
Vapor Density (Air = 1): >1
Boiling Point: 175.6°C (348°F) - 370°C (698°F)
Solubility: Soluble in hydrocarbons; insoluble in water
Freezing Point: Not Applicable
Melting Point: Not Applicable
Specific Gravity: 0.8 - 0.88 @ 15.6°C (60.1°F) (Typical)
Viscosity: 1.9 cSt - 4.1 cSt @ 40°C (104°F)

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

Skin Sensitization: This material did not cause skin sensitization reactions in a Buehler guinea pig test.

Acute Dermal Toxicity: LD50: >5ml/kg (rabbit).

Acute Oral Toxicity: LD50: > 5 ml/kg (rat)

Acute Inhalation Toxicity: 4 hour(s) LC50: > 5mg/l (rat).

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains gas oils.

CONCAWE (product dossier 95/107) has summarized current health, safety and environmental data available for a number of gas oils, typically hydrodesulfurized middle distillates, CAS 64742-80-9, straight-run middle distillates, CAS 64741-44-2, and/or light cat-cracked distillate CAS 64741-59-9.

CARCINOGENICITY: All materials tested have caused the development of skin tumors in mice, but all featured severe skin irritation and sometimes a long latency period before tumors developed. Straight- run and cracked gas oil samples were studied to determine the influence of dermal irritation on the carcinogenic activity of middle distillates. At non-irritant doses the straight-run gas oil was not carcinogenic, but at irritant doses, weak activity was demonstrated. Cracked gas oils, when diluted with mineral oil, demonstrated carcinogenic activity irrespective of the occurrence of skin irritation. Gas oils were tested on male mice to study tumor initiating/promoting activity. The results demonstrated that while a straight-run gas oil sample was neither an initiator or promotor, a blend of straight-run and FCC stock was both a tumor initiator and a promoter.

GENOTOXICITY: Hydrotreated & hydrodesulfurized gas oils range in activity from inactive to weakly positive in in-vitro bacterial mutagenicity assays. Mouse lymphoma assays on straight-run gas oils without subsequent hydrodesulphurization gave positive results in the presence of S9 metabolic activation. In-vivo bone marrow cytogenetics and sister chromatic exchange assay exhibited no activity for straight-run components with or without hydrodesulphurization. Thermally or catalytically cracked gas oils tested with in-vitro bacterial mutagenicity assays in the presence of S9 metabolic activation were shown to be mutagenic. In-vitro sister chromatic exchange assays on cracked gas oil gave equivocal results both with and without S9 metabolic activation. In-vivo bone marrow cytogenetics assay was inactive for two cracked gas oil samples. Three hydrocracked gas oils were tested with in-vitro bacterial mutagenicity assays with S9, and one of the three gave positive results. Twelve distillate fuel samples were tested with in-vitro bacterial mutagenicity assays & with S9 metabolic activation and showed negative to weakly positive results. In one series, activity was shown to be related to the PCA content of samples tested. Two in-vivo studies were also conducted. A mouse dominant lethal assay was negative for a sample of diesel fuel. In the other study, 9 samples of No 2 heating oil containing 50% cracked stocks caused a slight increase in the number of chromosomal aberrations in bone marrow cytogenetics assays. DEVELOPMENTAL TOXICITY: Diesel fuel vapor did not cause fetotoxic or teratogenic effects when pregnant rats were exposed on days 6-15 of pregnancy. Gas oils were applied to the skin of pregnant rats daily on days 0-19 of gestation. All but one (coker light gas oil) caused fetotoxicity (increased resorptions, reduced litter weight, reduced litter size) at dose levels that were also maternally toxic.

This product contains naphthalene. GENERAL TOXICITY: Exposure to naphthalene has been reported to cause methemoglobinemia and/or hemolytic anemia, especially in humans deficient in the enzyme glucose-6-phosphate dehydrogenase. Laboratory animals given repeated oral doses of naphthalene have developed cataracts. REPRODUCTIVE TOXICITY AND BIRTH DEFECTS: Naphthalene did not cause birth defects when administered orally to rabbits, rats, and mice during pregnancy, but slightly reduced litter size in mice at dose levels that were lethal to the pregnant females. Naphthalene has been reported to cross the human placenta. GENETIC TOXICITY: Naphthalene caused chromosome aberrations and sister chromatid exchanges in Chinese hamster ovary cells, but was not a mutagen in several other in- vitro tests.

CARCINOGENICITY: In a study conducted by the National Toxicology Program (NTP), mice exposed to 10 or 30 ppm of naphthalene by inhalation daily for two years had chronic inflammation of the nose and lungs and increased incidences of metaplasia in those tissues. The incidence of benign lung tumors (alveolar/bronchiolar adenomas) was significantly increased in the high-dose female group but not in the male groups. In another two-year inhalation study conducted by NTP, exposure of rats to 10, 30, and 60 ppm naphthalene caused increases in the incidences of a variety of nonneoplastic lesions in the nose. Increases in nasal tumors were seen in both sexes, including olfactory neuroblastomas in females at 60 ppm and adenomas of the respiratory epithelium in males at all exposure levels. The relevance of these effects to humans has not been established. No carcinogenic effect was reported in a 2-year feeding study in rats receiving naphthalene at 41 mg/kg/day.

This product may contain significant amounts of Polynuclear Aromatic Hydrocarbons (PAH's) which have been shown to cause skin cancer after prolonged and frequent contact with the skin of test animals. Brief or intermittent skin contact with this product is not expected to have serious effects if it is washed from the skin. While skin cancer is unlikely to occur in human beings following use of this product, skin contact and breathing, of mists, vapors or dusts should be reduced to a minimum.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY
96 hour(s) LC50: 21-210 mg/l (Salmo gairdneri)
48 hour(s) EC50: 20-210 mg/l (Daphnia magna)
72 hour(s) EC50: 2.6-25 mg/l (Raphidocellus subcapitata)
This material is expected to be toxic to aquatic organisms.

ENVIRONMENTAL FATE
On release to the environment the lighter components of diesel fuel will generally evaporate but depending on local environmental conditions (temperature, wind, mixing or wave action, soil type, etc.) the remainder may become dispersed in the water column or absorbed to soil or sediment. Diesel fuel would not be expected to be readily biodegradable. In a modified Strum test (OECD method 301B) approximately 40% biodegradation was recorded over 28 days. However, it has been shown that most hydrocarbon components of diesel fuel are degraded in soil in the presence of oxygen. Under anaerobic conditions, such as in anoxic sediments, rates of biodegradation are negligible.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: GAS OIL, COMBUSTIBLE LIQUID, UN1202,III

IMO/IMDG Shipping Description: UN1202, GAS OIL, 3, III, FLASH POINT SEE SECTION 5

ICAO/IATA Shipping Description: UN1202, GAS OIL, 3, III

SECTION 15 REGULATORY INFORMATION

EPCRA 311/312 CATEGORIES:

1. Immediate (Acute) Health Effects: YES
2. Delayed (Chronic) Health Effects: YES
3. Fire Hazard: YES
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313	07=PA RTK
01-2A=IARC Group 2A	04=CA Proposition 65	
01-2B=IARC Group 2B	05=MA RTK	
02=NTP Carcinogen	06=NJ RTK	

The following components of this material are found on the regulatory lists indicated.

Diesel Fuel No. 2	07
Distillates, straight run middle (gas oil, light)	06
Kerosine	05, 0 6, 07
Naphthalene	01-2 B, 02, 03, 04, 05, 06, 07

CERCLA REPORTABLE QUANTITIES(RQ)/EPCRA 302 THRESHOLD PLANNING QUANTITIES(TPQ):

Component	Component RQ	Component TPQ	Product RQ
Naphthalene	100 lbs	None	55556 lbs

CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

NEW JERSEY RTK CLASSIFICATION:

Refer to components listed in Section 2. Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: DIESEL FUEL

WHMIS CLASSIFICATION:

Class B, Division 3: Combustible Liquids
Class D, Division 2, Subdivision A: Very Toxic Material - Carcinogenicity
Class D, Division 2, Subdivision B: Toxic Material - Skin or Eye Irritation

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 2 Reactivity: 0

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

Additional Product Number(s): CPS203413, CPS203417, CPS220122, CPS225114, CPS225115, CPS225150, CPS266176, CPS270000, CPS270005, CPS270094, CPS270095, CPS270096, CPS271006, CPS272006, CPS272007, CPS272008, CPS272009, CPS272010, CPS272011, CPS272012, CPS272013, CPS272093, CPS272102, CPS272126, CPS272152, CPS272185, CPS272190, CPS272195, CPS272593, CPS272601, CPS272693, CPS272793, CPS273003, CPS273030, CPS273053, CPS275000

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet: 16.

Revision Date: July 31, 2006

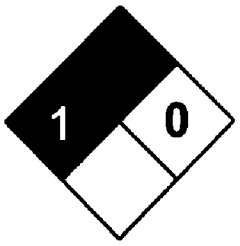
ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Chevron Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

ScienceLab.com
Chemicals & Laboratory Equipment



Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247
International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk; evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/
m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)
Odor: Not available.
Taste: Not available.
Molecular Weight: 207.21 g/mole
Color: Bluish-white. Silvery. Gray
pH (1% soln/water): Not applicable.
Boiling Point: 1740°C (3164°F)
Melting Point: 327.43°C (621.4°F)
Critical Temperature: Not available.
Specific Gravity: 11.3 (Water = 1)
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: Not available.
Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat
Incompatibility with various substances: Reactive with oxidizing agents.
Corrosivity: Non-corrosive in presence of glass.
Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungs by mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually absorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, delirium, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under
the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the
European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.): Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.): Health: 1

Flammability: 0

Reactivity: 0

Specific hazard: Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 11/01/2010 12:00 PM

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Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Havollne® Motor Oil (Deposit Shield)

Product Use: Engine Oil
Product Number(s): CPS223391, CPS223392, CPS223393, CPS223394, CPS223395, CPS223396, CPS223397
Synonyms: Havollne® Motor Oil SAE 10W-30, Havoline® Motor Oil SAE 10W-40, Havoline® Motor Oil SAE 20W-50, Havoline® Motor Oil SAE 30, Havoline® Motor Oil SAE 40, Havoline® Motor Oil SAE 5W-20, Havoline® Motor Oil SAE 5W-30
Company identification
Chevron Products Company
Global Lubricants
6001 Bollinger Canyon Road
San Ramon, CA 94583
United States of America

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product information
email : lubemsds@chevrontexaco.com
Product Information: 800-LUBE-TEK
MSDS Requests: 800-414-6737

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Highly refined mineral oil (C15 - C50)	Mixture	70 - 95 %weight

SECTION 3 HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS
Eye: Not expected to cause prolonged or significant eye irritation.
Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.
Ingestion: Not expected to be harmful if swallowed.
Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.
Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.
Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.
Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:
OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

FLAMMABLE PROPERTIES:
Flashpoint: (Cleveland Open Cup) 200 °C (392 °F) (Min)
Auto ignition: No Data Available
Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.
Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Keep out of the reach of children.
General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR
1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.
Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:
Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT
Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted physical requirements and other substances in the workplace. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Silver Shield, Viton.
Respiratory Protection: No respiratory protection is normally required.
If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Agency	TWA	STEL	Ceiling	Notation
Highly refined mineral oil (C15 - C50)	ACGIH	5 mg/m3	10 mg/m3	--	--
Highly refined mineral oil (C15 - C50)	OSHA Z-1	5 mg/m3	--	--	--

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Amber
Physical State: Liquid **Odor:** Petroleum odor **pH:** Not Applicable
Vapor Pressure: <0.01 mmHg @ 100 °C (212 °F)
Vapor Density (Air = 1): >1
Boiling Point: >315°C (599°F)
Solubility: Soluble in hydrocarbons; insoluble in water
Freezing Point: Not Applicable
Specific Gravity: 0.87 @ 15.6°C (60.1°F) / 15.6°C (60.1°F) (Typical)
Density: 0.866 kg/l @ 15°C (59°F) (Typical)
Viscosity: 7.6 mm2/s @ 100°C (212°F) (Min)

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS
Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.
Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.
Skin Sensitization: The skin sensitization hazard is based on evaluation of data for similar materials or product components.
Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.
Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.
Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:
This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B). These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3).

During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly removed by washing with soap and water.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY
This material is not expected to be harmful to aquatic organisms.

ENVIRONMENTAL FATE
This material is not expected to be readily biodegradable.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR
Additional Information: NOT HAZARDOUS BY U.S. DOT. ADR/RID HAZARD CLASS NOT APPLICABLE.

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT U N D E R THE IMDG CODE

ICAO/IATA Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT U N D E R ICAO

SECTION 15 REGULATORY INFORMATION

EPCRA 311/312 CATEGORIES:

1.	Immediate (Acute) Health Effects:	NO
2.	Delayed (Chronic) Health Effects:	NO
3.	Fire Hazard:	NO
4.	Sudden Release of Pressure Hazard:	NO
5.	Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313	07=PA RTK
01-2A=IARC Group 2A	04=CA Proposition 65	
01-2B=IARC Group 2B	05=MA RTK	
02=NTP Carcinogen	06=NJ RTK	

No components of this material were found on the regulatory lists above.

CHEMICAL INVENTORIES:
All components comply with the following chemical inventory requirements: EINECS (European Union), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

One or more components has been notified but may not be listed in the following chemical inventories: DSL (Canada). Secondary notification by the importer may be required.

One or more components does not comply with the following chemical inventory requirements: AICS (Australia), ENCS (Japan).

NEW JERSEY RTK CLASSIFICATION:
Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: PETROLEUM OIL (Motor oil)

WHMIS CLASSIFICATION:
This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 1 Flammability: 1 Reactivity: 0
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE: - Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

LABEL RECOMMENDATION:
Label Category: ENGINE OIL 1 - ENG1

REVISION STATEMENT: This is a new Material Safety Data Sheet.
Revision Date: October 02, 2006

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Chevron Energy Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

UNLEADED GASOLINE (ALL GRADES)
MATERIAL SAFETY DATA SHEET

Petrocom Energy Group, LLC
1330 Post Oak Blvd., Suite 2350
Houston, Texas 77056
Phone: 713-418-3000
Fax: 713-418-3001

Revision Date: 03/05/2008

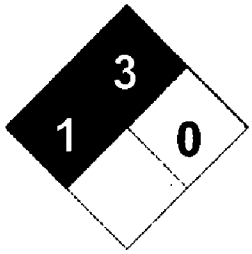
Section 1: Product Identification

Name: Unleaded Gasoline
Synonyms: Regular/Midgrade/Premium Gasoline, Motor Fuel, Reformulated Gasoline, RFG, Conventional Gasoline.
CAS No.: 86290-81-5
MSDS No.: PEG-UNL
Use: Motor fuel

Section 2: Product Composition

Component	CAS Number	Amount (%)
Gasoline	86290-81-5	0 – 100
Benzene	71-43-2	0 – 5
Toluene	108-88-3	0 – 30
Xylene (all isomers)	1330-20-7	0 – 25
Hexane (other isomers)	Mixture	5 – 25
n-Hexane	110-54-3	0 – 3
Cyclohexane	110-82-7	0 – 3
Octanes (all isomers)	Mixture	0 – 20
Heptane (all isomers)	142-82-5	0 – 15
Ethanol	64-17-5	0 – 10
Pentanes (all isomers)	Mixture	0 – 20
Trimethylbenzenes (all isomers)	95-63-6	0 – 5
Ethylbenzene	100-41-4	0 – 5
Cumene	98-82-8	0 – 5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 – 16
Tertiary Amyl Methyl Ether (TAME)	994-05-8	0 – 6

Section 3: Hazards Identification

Emergency Overview	Hazard Rankinas
DANGER! Extremely Flammable liquid and vapor Harmful if swallowed Skin Irritant May cause eye and respiratory irritation Cancer Hazard – Contains material which can cause cancer	**NFPA** 

Physical form: Liquid
Appearance: Clear to amber
Odor: Strong, Gasoline

Potential Health Effects

Eyes: Contact with eyes may cause irritation, redness, tearing, stinging, watering and blurred vision.

Skin: Contact with skin may cause irritation, itching, redness and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, and may also cause dermatitis and inflammation. (See also section 11).

Inhalation: Breathing high concentration can be harmful. Throat and lung irritation may occur. Central nervous system effects including nausea, euphoria, dizziness, headache, fatigue, drowsiness or unconsciousness may occur due to long term or high concentration exposure to vapors.

Ingestion: Toxic if swallowed. This product may cause nausea, vomiting, dizziness, drowsiness, diarrhea if swallowed. Central nervous system effects may be caused. Swallowing this product can result in severe lung damage and/or death.

Signs / Symptoms: When overexposed to this product effects such as nausea, vomiting, blurred vision, respiratory failure, central nervous system depression, unconsciousness, tremor, death may occur.

See toxicological Information (section 11)

Section 4: First Aid Measures

Eye contact:

Flush eyes immediately with fresh, cool water for at least 15 minutes. If irritation or redness or any symptoms persist, seek medical attention.

Skin contact:

Remove contaminated clothes and shoes. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, wash affected area thoroughly with soap and water. If irritation or redness develops, seek medical attention.

Inhalation (Breathing):

If inhaled, immediately move person to fresh air. If there is difficulty breathing, give oxygen. If not breathing, immediately give artificial respiration. Seek medical attention.

Ingestion (Swallowing):

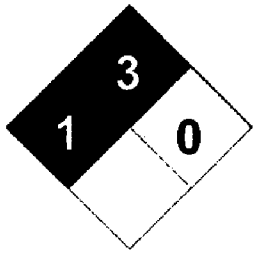
This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. Do not induce vomiting. Do not give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is unconscious or drowsy, place on the left side with the head down. Seek immediate medical attention.

Notes to Physician:

This material sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.
Inhalation overexposure can produce toxic effects. Monitor respiratory distress. If difficulty in breathing evaluate upper respiratory tract inflammation, bronchitis and pneumonitis. Administer supplemental oxygen as required.
If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Cinsuder activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

Section 5: Fire Fighting Measures

NFPA Hazard Class: Health = 1; Flammability = 3; Instability = 0
(0 – Minimal; 1 – Slight; 2 – Moderate; 3 – Serious; 4 – Severe)



Auto – ignition temperature: >260 °C (500 °F)

Flash point	: Closed cup: -43 °C (-45 °F)
Flammable limits	: Lower: approximately 1.4% Upper: approximately 7.6%
Products of combustion	: Carbon monoxide, carbon dioxide, nitrogen and sulfur oxides, smoke, fumes, unburned hydrocarbons and other products of incomplete combustion.
Special properties	: Flammable liquid! This material can be ignited by heat, sparks, flames or other sources of ignition. Vapors may travel long distances to a source where they can ignite and flash back, or explode. A mixture of vapor and air can create an explosion hazard in contined spaces. If container is not properiy cooled, it can rupture n the heat of a fire.
Extinguishing media	: Use of dry chemical, carbon dioxide, or foam is recommended to extinguish fire. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may not extinguish the fire, unless it is used by experienced fire fighters and under favorable conditions.
Protective Equipment for Fire Fighters	: Fire fighters should wear appropriate protective equipment and self contained breathing apparatus (SCBA) with a full face piece operated in positive pressure mode.

Section 6: Accidental Release Measures

Personal precautions: This material is extremely flammable. Eliminate all ignition sources. Keep all hot metal surfaces away from spill/release. All equipment used when handling this material must be grounded.

Spill precautions: Stay upwind and away from spill. Notify persons downwind of the spill, isolate spill area and keep unauthorized personnel out. If it can be done with minimal risk, try to stop spill. Always wear protective equipment, including respiratory protection. Contact emergency personnel.

Environmental precautions: Prevent spilled material from entering sewers, drains, soil, and natural waterways. Use foam or spills to minimize vapors (section 5). Spilled material may be absorbed into an appropriate absorbent material.

Methods for cleaning up: Notify fire authorities and appropriate federal, state and local agencies. Immediate cleanup is recommended.

Section 7: Handling and Storage

Handling: Flammable liquid and vapor. To be used only as a motor fuel. Avoid inhalation of vapors and contact with skin. Wash hands thoroughly after handling this material. Use in a well ventilated area away from all ignition sources. Use product with caution around heat, sparks, static electricity and open flames. Static electricity may ignite vapors and cause fire.

Empty containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks or other ignition sources. The may explode and cause injury and/or death. Empty drums should be completely drained, properly bunged, and returned promptly to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Storage: Store in approved containers only. Keep in tightly closed containers in cool, dry, well ventilated areas. Keep isolated away from heat, sources of ignition and hot metal surfaces.

Section 8: Exposure Controls / Personal Protection

Engineering controls: Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below their occupational exposure limits. Eyewash stations and safety showers should be located near the work-station.

Personal Protection

Eye Protection: Keep away from eyes. Safety glasses complying with approved standards should be worn. Chemical type goggles should be worn.

Skin Protection: Keep away from skin. Skin protection should be worn. Chemical resistant, impervious gloves should be worn. Always follow good personal hygiene practices after handling the material.

Respiratory Protection: Approved respiratory equipment must be used if a risk assessment indicates it is necessary. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn.

General Protection: Use this material in well ventilated areas. Ventilation equipment should be explosion proof also.

Component	Applicable Workplace Exposure Limits
Gasoline	ACGIH – TWA: 300 ppm (8 hours) STEL: 500 ppm (15 minutes)
Benzene	ACGIH – TWA: 0.5 ppm (8 hours) STEL: 2.5 ppm (15 minutes) OSHA – TWA: 1 ppm (8 hours) STEL: 5 ppm (15 minutes)
Toluene	ACGIH – TWA: 20 ppm (8 hours) OSHA – TWA: 200 ppm (8 hours) CEIL: 300 ppm PEAK: 500 ppm (10 minutes)
Xylene (all isomers)	ACGIH – TWA: 100 ppm (8 hours) STEL: 150 ppm (15 minutes) OSHA – TWA: 100 ppm (8 hours)
Hexane (other isomers)	ACGIH – TWA: 500 ppm (8 hours) STEL: 1000 ppm (15 minutes)
n-Hexane	ACGIH – TWA: 50 ppm (8 hours) OSHA – TWA: 500 ppm (8 hours)
Cyclohexane	ACGIH – TWA: 100 ppm (8 hours) OSHA – TWA: 300 ppm (8 hours)
Octanes (all isomers)	ACGIH – TWA: 300 ppm (8 hours) OSHA – TWA: 500 ppm (8 hours)
Heptane (all isomers)	ACGIH – TWA: 400 ppm (8 hours) STEL: 5000 ppm (15 minutes) OSHA – TWA: 500 ppm (8 hours)
Ethanol	ACGIH – TWA: 1000 ppm (8 hours) OSHA – TWA: 1000 ppm (8 hours)
Pentanes (all isomers)	ACGIH – TWA: 600 ppm (8 hours) OSHA – TWA: 1000 ppm (8 hours)
Trimethylbenzenes (all isomers)	ACGIH – TWA: 25 ppm (8 hours)
Ethylbenzene	ACGIH – TWA: 100 ppm (8 hours) STEL: 125 ppm (15 minutes) OSHA – TWA: 100 ppm (8 hours)
Cumene	ACGIH – TWA: 50 ppm (8 hours) OSHA – TWA: 50 ppm (8 hours)
Methyl Tertiary Butyl Ether (MTBE)	ACGIH – TWA: 50 ppm (8 hours)
Tertiary Amyl Methyl Ether (TAME)	ACGIH – TWA: 20 ppm (8 hours)

Section 9: Physical and Chemical Properties

Physical State:	Liquid.
Color:	Transparent, clear to amber liquid.
Odor:	Strong. Characteristic gasoline odor.
pH:	Not applicable
Boiling Point:	>26 °C (>78 °F)
Melting Point:	Not applicable.
Specific gravity:	0.66 to 0.75 (Water = 1)
Vapor density:	3 to 4 (Air = 1)
Vapor pressure:	220-450 mm Hg at 20°C (68°F) / 6-15 Reid-psia at 37.8°C (100°F)
Volatility:	720 – 770 g/l VOC (w/v)
Viscosity (at 40 °C):	< 1
Flash Point:	< -45 °F / < 43°C
Bulk Density:	6.0 – 6.4 lbs/gal
Solubility in water:	Negligible

Section 10: Stability and Reactivity

Stability: Stable. Extremely flammable liquid and vapor. Vapor can cause fire.

Conditions to avoid: Keep away from heat, flame and all other possible sources of ignition.

Materials to avoid: Keep away from strong oxidizing agents such as acids, chlorine, hydrogen peroxide and oxygen.

Hazardous decomposition products: Please refer to the combustion products identified in Section 5 of this MSDS.

Hazardous Polymerization: Not expected to occur.

Section 11: Toxicological Information

Toxicology Information

Oral toxicity:	Almost non-toxic. LD 50: > 2000 mg/kg (species: rats)
Dermal toxicity:	Almost non-toxic. LD 50: > 2000 mg/kg (species: rabbits)
Inhalation toxicity:	Almost non-toxic. LD 50: > 5 mg/l (species: rats)
Eye irritation:	Almost non-irritating. Draize score: > 6 and < 15 (species: rabbits)
Skin irritation:	Irritant. Primary irritation index: > 3 and < 5 (species: rabbits)
Other data:	Inhalation of high concentrations of vapors or mists may cause respiratory system irritation and damage. It may also result in the damage and depression of the central nervous system and may cause death. Prolonged contact with the material may cause severe skin irritation.
Subchronic toxicity:	Dermal studies resulted in significant irritation but not systematic toxicity (species: rabbits). Inhalation exposures (90 day, approximately 1500 ppm vapor) produced light hydrocarbon nephropathy but no significant systemic toxicity (species: rats).
Neurotoxicity:	Repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments. However, no persistent neurotoxic effects were observed in subchronic inhalation studies of gasoline.
Reproductive toxicity:	An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother or the fetus. Another inhalation study in rats exposed to 3000, 6000, or 9000 ppm of gasoline vapor, 6 hours per day on day 6 through 20 of gestation, also showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.
Chronic toxicity:	A lifetime mouse skin painting study of unleaded gasoline applied at 50 microliters, three time weekly, resulted in some severe skin irritation and changes, but no statistically significant increase in skin cancer or cancer to any other organ. Lifetime inhalation of wholly vaporized unleaded gasoline over 2000 ppm has caused increased liver tumors in female mice and increased kidney tumors in male rats. The EPA has concluded that mechanism by which wholly vaporzied unleaded gasoline causes kidney damage is unque to the male rat. The effects in that species (kidney damage and cancer) should not be used in human risk assessment.

Other toxic effects on humans	Extremely hazardous in case of ingestion. Very hazardous in case of eye contact. Hazardous in case of skin contact. Slightly hazardous in case of inhalation.
Carcinogenic effects:	Contains material that may cause cancer depending on the level and duration of exposure.
Target organs:	Contains material that may cause damage to humans organs such as (but not limited to) blood, kidneys, lungs, liver, eye, skin, nervous system and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity:	This material may be toxic to aquatic organisms such as algae and daphnia. It has also shown to be toxic to fish.
Environmental fate:	The material is expected to be readily biodegradable. When released into the environment, some of the constituents of gasoline will volatilize and be photo degraded in the atmosphere. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions, photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline.

Section 13: Disposal Considerations

Waste disposal:	Avoid disposal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product and any of its by products should always comply with the requirements of environmental protection and waste disposal legislation and any local authority requirements. This material would likely be identified as a federally regulated RCRA hazardous waste. See sections 7 and 8 for further information on handling, storage and personal protection. See section 9 for the material's physical and chemical properties.

Section 14: Transportation Information

This material is U.S Department of Transportation (DOT) regulated material.

Shipping name:	Gasoline, 3, UN 1203, PG II Gasohol, 3, NA 1203, PG II (for gasoline blended with less than 20% ethanol).
Hazard class:	3 DOT Class: Flammable liquid
Packing Group:	II
UN / NA Number:	UN1203 / NA1203
Emergency Response Code:	128
Label:	

Section 15: Regulatory Information

TSCA Inventory:	This product and/or its components are listed on the Toxic Substances Control Act (TSCA)
SARA 302 / 304: Emergency planning and notification	The Superfund Amendments and Reauthorizafion Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and CFR 355. No components were identified.
SARA 311 / 312: Hazard identification	SARA Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under: Fire, Acute (immediate) Health Hazard, Chronic (Delayed) Health Hazard.

CERCLA / SARA 313: This material contains the following chemicals subject to the **Toxic and chemical** and **notification and release reporting** reporting requirements of Section 313 of SARA Title III 40 CFR 372

Component	CAS Number	Amount (%)
Benzene	71-43-2	0 – 5
Toluene	108-88-3	0 – 30
Xylene (o, m, p isomers)	1330-20-7	0 – 25
n-Hexane	110-54-3	0 – 3
Cyclohexane	110-82-7	0 – 3
1, 2, 4 Trimethylbenzenes	95-63-6	0 – 5
Ethylbenzene	100-41-4	0 – 5
Cumene	98-82-8	0 – 5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 – 16

California Proposition 65: This material may contain detectable quantities of the following chemicals known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Benzene (CAS NO. 71-43-3)
Toluene (CAS No. 108-88-3)
Ethylbenzene (CAS No. 100-41-4) Naphthalene (CAS No. 91-20-3)

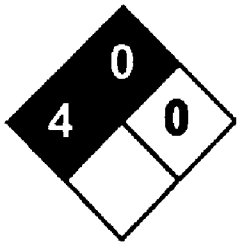
Canadian Regulations: WHMIS Hazard Class: B2 – Flammable Liquids
D2A – Very Toxic Material

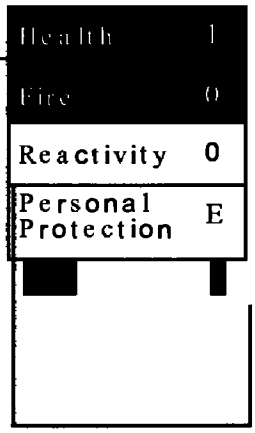
Section 16: Other Information

Issue date: March 5, 2008
Previous issue date: No previous date
Version: 1
MSDS Code: PEG-UNL

Legend:
ACGIH = American Conference of Governmental Industrial Hygienists
CAS = Chemical Abstracts Service Registry
CEIL = Ceiling Limit
CERCLA = The Comprehensive Environmental Response, Compensation and Liability Act
EPA = Environmental Protection Agency
NFPA = National Fire Protection Association
OSHA = Occupational Safety and Health Administration
SARA = Superfund Amendments and Reauthorization
Act STEL = Short Term Exposure Limit (15 minutes)
TWA = Time Weighted Average (8 hours)
WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer:
The information presented in this Material Safety Data Sheet (MSDS) d on data believed to be accurate as of the issuance date of this MSDS. No warranty is expressed or implied for the accuracy or completeness of the above provided information. Petrocom Energy Group, LLC does not assume any liability for any damage or injury arising out of product use by others. The end user of the product has the responsibility for evaluating the accuracy of the data, and determining the safety, toxicity and suitability of the product under any conditions.





ScienceLab.com
Chemicals & Laboratory Equipment

Material Safety Data Sheet
Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65% Catalog Codes: SLN2161
CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming

CI#: Not applicable. Synonym: Nitric Acid, 65% Chemical Name: Not applicable.
Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247
International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS#	o/o by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion,. Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. if not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable. Auto-Ignition Temperature: Not applicable. Flash Points: Not applicable.
Flammable Limits: Not applicable. Products of Combustion: Not available.
Fire Hazards in Presence of Various Substances: of combustible materials

Explosion Hazards in Presence of Various Substances:
Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.
Fire Fighting Media and Instructions: Not applicable. Special Remarks on Fire Hazards:
Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

Special Remarks on Explosion Hazards:
Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid + Nitrobenzene + water. Detonation with Nitric Acid+ 4-Methylcyclohexane. (Nitric acid, fuming)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non- combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing..). Keep substances damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up..Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or
the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials,
organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Acrid. Disagreeable and choking. (Strong.) Taste: Not available.

Molecular Weight: Not applicable. Color: Colorless to light yellow.
pH (1% soln/water): Acidic. Boiling Point: 121ac (249.8°F) Melting Point: -41.6°C (-42.9°F)

Critical Temperatura: Not available. Specific Gravity: 1.408 (Water = 1)

Vapor Pressure: 6 kPa (@ 20°C) Vapor Density: 2.5 (Air = 1) Volatility: Not available.
Odor Threshold: 0.29 ppm Water/Oil Dist. Coeff.: Not available. Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble In cold water, hot water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable. Instability Temperature: Not available. Conditions of Instability:
Incompatible materials
Incompatibility with various substances:
Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

Special Remarks on Reactivity:
A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid+ Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

Special Remarks on Corrosivity:
In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion. Toxicity to Animals:
LDSO: Not available. LCSO: Not available. Chronic Effects on Humans:

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg
(Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomit. May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contraction or spasticity, weakness, loss of coordination, mental confusion), and urinary system (kidney failure, decreased urinary output after several hours of

Section 12: Ecological Information

Ecotoxicity: Not available. BODS and COD: Not available. Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise. Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself. Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material Identification:: Nitric acid UNNA: 2031 PG: II Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
New York release reporting list: Nitric acid, fuming
Rhode Island RTK hazardous substances: Nitric acid, fuming
Pennsylvania RTK: Nitric acid, fuming
Florida: Nitric acid, fuming
Minnesota: Nitric acid, fuming
Massachusetts RTK: Nitric acid, fuming
New Jersey: Nitric acid, fuming
TSCA 8{b) inventory: Water; Nitric acid, fuming
SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming
SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65%
CERCLA: Hazardous substances: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). Other Classifications: HMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E:Corrosive liquid.
DSCL (EEC):
R8- Contact with combustible material may cause fire.
R35- Causes severe burns.
S23- Do not breathe gas/fumes/vapor/ spray[""**]
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S36- Wear suitable protective clothing.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
HMIS (U.S.A.): Health Hazard:3
Fire Hazard:0
Reactivity:0
Personal Protection:
National Fire Protection Association (U.S.A.): Health:4
Flammability:0
Reactivity: 0 Specific hazard: Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information References: Not available.

Other Special Considerations: Not available
Created: 10/10/2005 10:59 AM
Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Health & Safety Plan
Rico Project

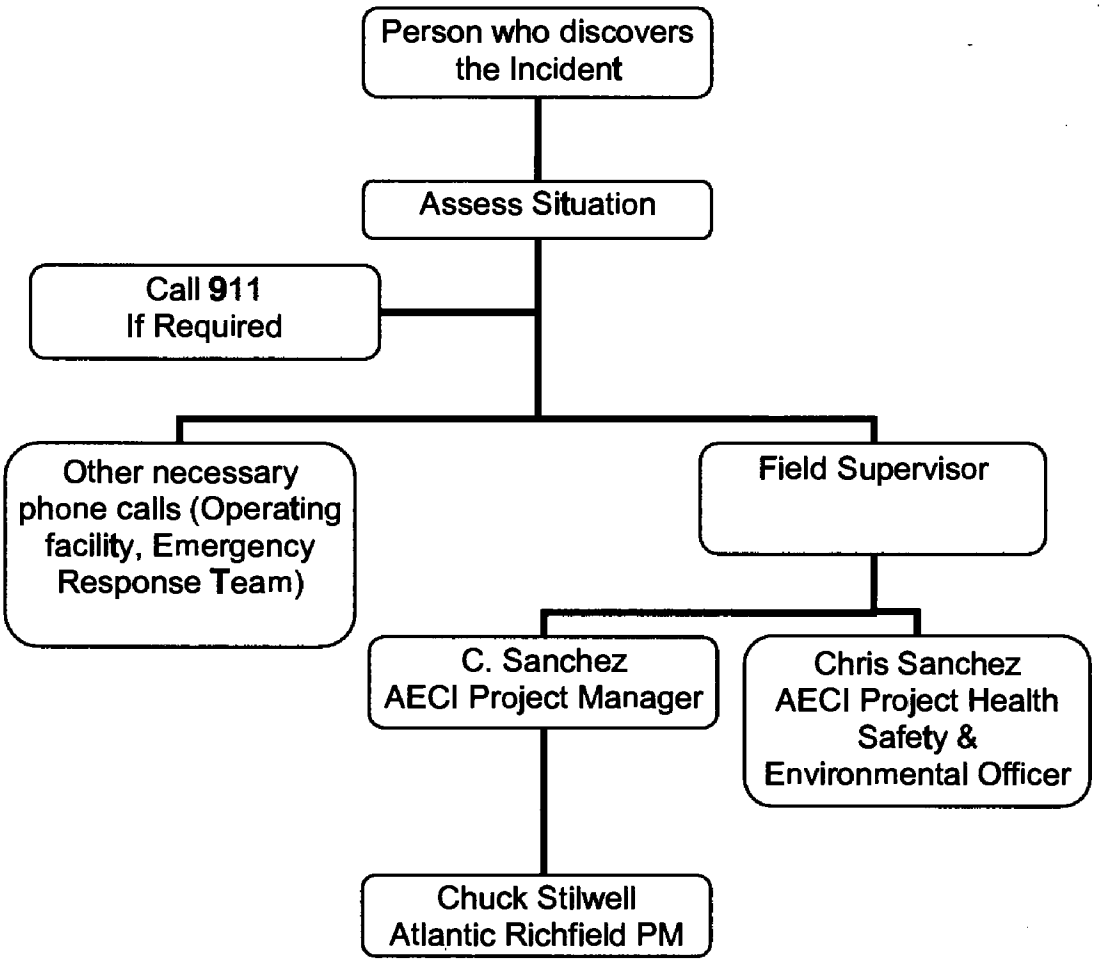
APPENDIX D

Notification and Reporting

Attachment 1
Incident Notification and Reporting Table Definitions

Incident Severity	Vehicle Incidents	Spill / Release / Vapor Disc	Unplanned Business Interruption	Fire / Explosion	Security	Personal Injury / Illness	Property Damage
MAJOR / HIGH POTENTIAL Refer to AECI Group Major Incident and High Potential Incident Reporting Guideline	Any incident resulting in a fatality or multiple serious injuries	Any spill or release >100 barrels or less in a sensitive area, RQ, off site impact, any spill or navigable water, release of 10 tons of classified material, or any spill >1 barrel and has a High Potential	Any accidental damage having a cost exceeding US $500,000	Any fire or explosion with offsite or significant onsite impact / any use of firefighting equipment – High Potential	Any serious threats to security, bomb threats, or kidnapping threats – High Potential	Any injuries or illnesses resulting in fatalities, 3 or multiple serious injuries	Any property damage > $500,000
NON-MAJOR INCIDENTS	Any incident involving an AERL vehicle including under the influence of D&A ($0 Cost Threshold)	Any spill < 100 barrels	Any unplanned business interruption hitting undergrou nd utilities, product lines, or claim impact on operating facility business	An other fire / explosion not categorized as a Major Incident	Any non-serious threat to security, including vandalism	Any injury or illness resulting in a DAFWC, AECI Amoco exposure, or OSHA Recordable	Any property damage up to $499,999
NEAR MISS	Any contractor vehicle incident without injury or property damage	Any potential for spill or release	Any complaint filed by an Operating Facility Business	Any risk of fire or explosion (i.e. working in LEL conditions, etc.)	N/A	All other injuries or illness including First Aid which does not result in medical treatment.	Any property damage less than $500

Attachment 2
2009 AECI Notification Tree



Initial Notification must be made immediately to the AECI Project Manager and AECI HSE Officer no matter how small the incident.

Attachment 3
Incident Notification and Reporting Process Table

	Notification		Initial Reporting		Investigation	
Incident Severity	Notification Required	When	Forms/ Reports	When	Forms/ Reports	When
MAJOR/ HIGH POTENTIAL	• AECI Project Manager • AECI HSE Officer • RM Contact • Incident Notification Center	Immediately	Major/High Potential Incident Announcement Forms OSHA 200 Log (as applicable)	Immediately	Major Incident Investigation Summary Report (10 day and 60 day)	10 Days (Preliminary) 60 Days (Final)
NON-MAJOR	• AECI Project Manager • AECI HSE Officer • RM Contact	Immediately	GEM Incident/ NM Inv. Report Form or equivalent OSHA 200 Log (as applicable)	Within 24 Hours	GEM Incident/ NM Inv. Report Form	14 Days or as otherwise noted
NEAR MISS	• AECI Project Manager • AECI HSE Officer • RM Contact	Immediately	Gem Incident/ NM Inv. Report Form or equivalent	Within 72 Hours	GEM Incident/ NM Inv. Report Form, when needed	14 Days or as otherwise noted

NOTE: If AECI PM is not available, Contractor is responsible for notifying another AECI manager.

*Initial and Final Reports may be done with participation from both Contractor and AECI Representatives, depending on severity.

Attachment 4
Emergency Information Summary

PPE Minimum Level of Protection: Level D

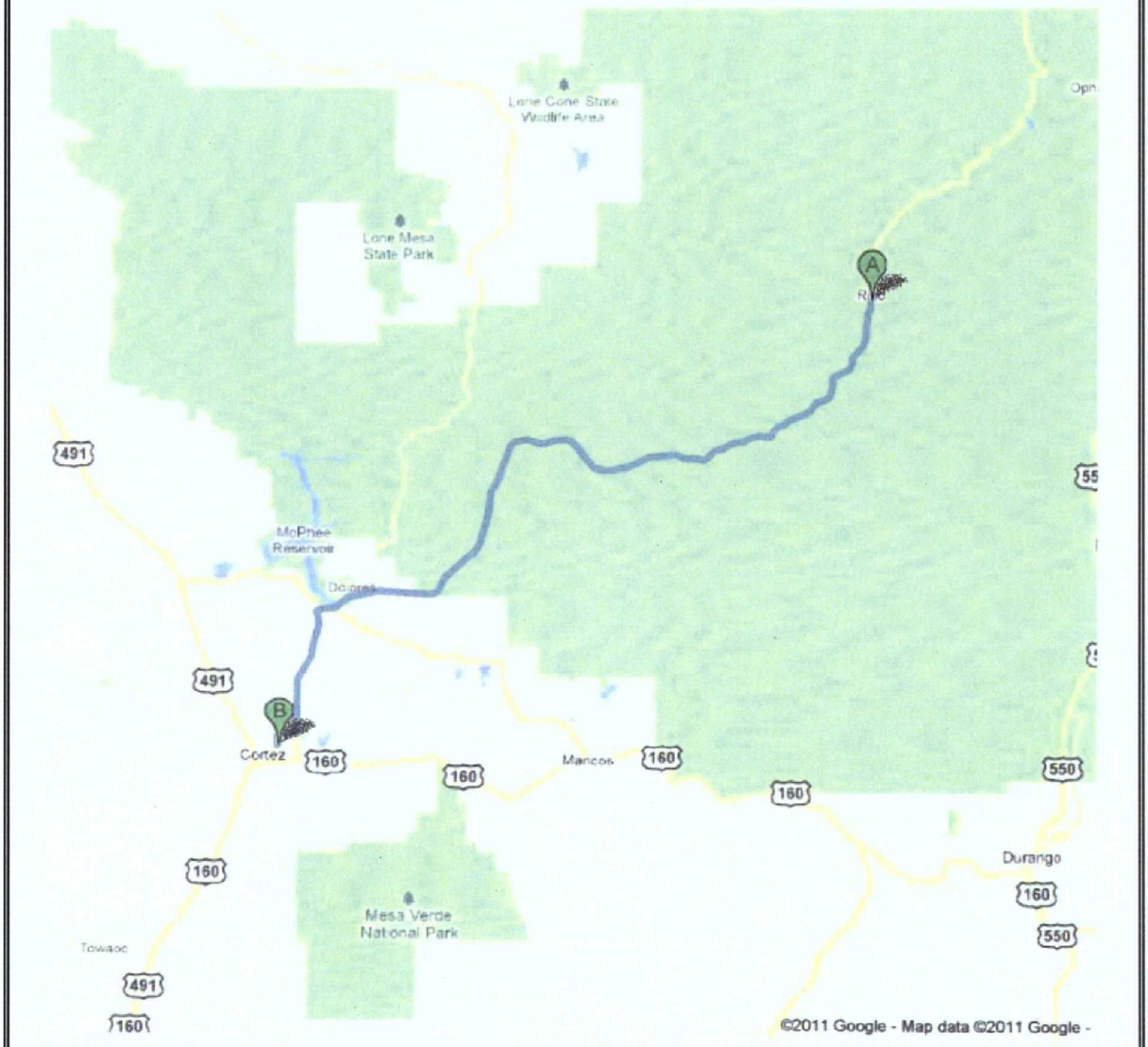
Do not endanger your own life. Survey the situation before taking any action.

Atlantic Richfield Company Office Telephone	972-509-7000
Site Location Address	St. Louis Ponds, North of Rico CO on CO State Hwy 145.
Telephone Located at	Site Supervisor will have cellular phone on site.

EMERGENCY PHONE NUMBERS In the event of any emergency contact the Project Manager or Site Health and Safety Officer.

Ambulance	911
Fire	911
State Police	911
Poison Control	911
Hospital Name	Southwest Medical Center 1311 N. Mildred Rd, Cortez CO 970-565-6666
Hospital Phone Number	See above
Project Manager	Chuck Stilwell mobile 406-491-1129
Site Health and Safety Officer	C. E. Sanchez – home – 505-287-5110 or mobile-801-971-1767
Health and Safety Representative	C. E. Sanchez – home – 505-287-5110 or mobile-801-971-1767
Site Supervisor	C. E. Sanchez – home – 505-287-5110 or mobile-801-971-1767
State Agency	Colorado Dept Public Health and Environment Voluntary Clean Up Group 303-692-3311

Attachment 5
Hospital Location Map



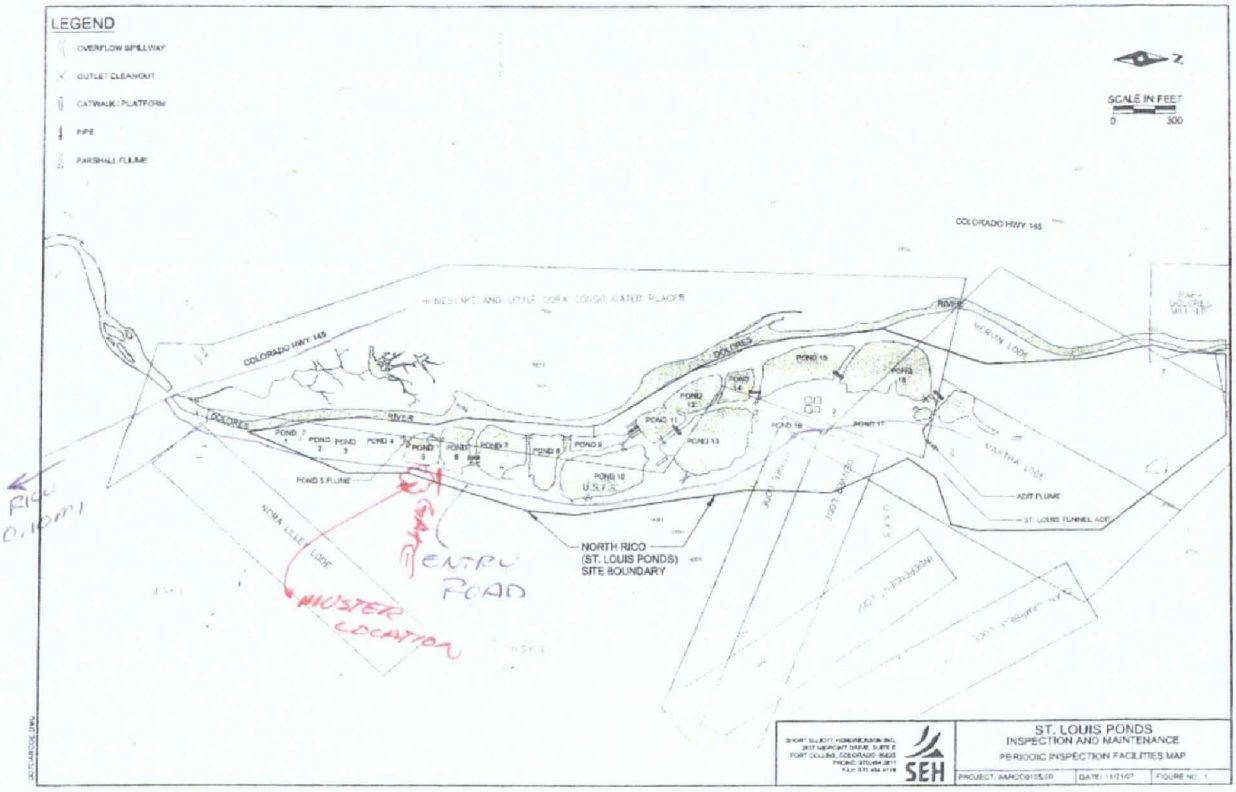
A N Glasgow Ave, Rico, CO 81332

145	1. Head **south** on **CO-145 S/N Glasgow Ave** toward **E Soda St** Continue to follow CO-145 S About 51 mins	go 45.6 mi total 45.6 mi
↱	2. Turn right onto **Alamosa Rd/Co Rd L** About 3 mins	go 1.0 mi total 46.6 mi
↰	3. Turn left onto **Co Rd 26/N Mildred Rd** Continue to follow N Mildred Rd Destination will be on the right About 2 mins	go 0.6 mi total 47.2 mi

B 1311 N Mildred Rd, Cortez, CO 81321

	HOSPITAL INFORMATION: Various – see above

LOWER AREA
ST LOUIS PONDS



Health & Safety Plan
Rico Project

APPENDIX E

Job Hazard Analysis and Risk Assessment

Potential Activity Hazard Analysis

General Physical Hazards

The Site may contain numerous physical safety hazards such as the following:

Physical Hazard	Potential Injury	Actions to Prevent or Reduce Exposure
Holes or ditches	Slip, trip, falls resulting in sprains, broken bones	Use access pathways into work areas which minimize this hazard, fill in if possible. Flag all holes and ditches. Install guardrails or barricades.
Precariously positioned objects, that may shift or fall, include loose rocks, slag material, etc.	Impact injuries, crushing, head injuries, pinning under objects. Falling object injuries. Slips, trips and falls.	Reduce work in all unstable areas as much as reasonably feasible. Never work under suspended or unstable loads or slopes.
Sharp objects	Cuts, abrasions and puncture wounds.	Make sure all sharp corners and edges are marked and guarded. Pick up sharp objects, glass etc. Boards with protruding nails should be disposed of if possible or have nails turned down. Use established gates for site access.
Slippery surfaces	Slips and falls	Use appropriate footwear and avoid slippery areas whenever possible. Establish handholds if possible.
Steep grades	Slips and falls	Avoid working on steep grades when possible. Tie off workers from above with appropriate fall protection gear.
Uneven terrain/ unstable surfaces	Slips, trips and falls	Avoid when possible. Minimize need to carry loads over uneven surfaces. Note and identify all unstable surfaces.
Heavy Equipment Operations	Pedestrian, vehicle and equipment collisions	Ground personnel to stay out of work area whenever possible. Establish and maintain eye contact with operator prior to entering the work area. Do not drive within 100 ft of operating equipment.
Protective Equipment	General increase in accident potential	Use of PPE may impair the employees' ability to see or hear which can result in an increased risk of accident. Ali personnel should be trained in the proper use and application of PPE.

Physical Hazard	Potential Injury	Actions to Prevent or Reduce Exposure
Jewelry, loose clothing	Loss of digits, pinning in machinery, death	Avoid wearing loose jewelry of any type within the work area. Loose or ragged clothing is not permitted in the work area due to the potential of being snagged in moving machinery.

Potential Activity Hazard Analysis

Access and Egress

Work site access and egress (exit) require awareness and safety procedures to avoid incidents. Work site locations vary a range of hazards.

Hazard	Potential Injury or Loss	Actions to Prevent or Reduce Exposure
Traffic Hazards	Collisions, pedestrian accidents, crushing or pinch points, serious injury, loss of limbs or life, equipment damage, work stoppage	Practice defensive driving. Designated access routes, defined work areas, defined entry and exit locations. Use of correct PPE including traffic vests.
Electrical Power Lines and Equipment (Lines may be Overhead or Underground)	Electrocution, severe burns, cardiac arrest, loss of life, fire, equipment damage, work stoppage	Excavation plans shall include identification of underground utilities including power lines. Overhead lines are to be identified and minimum clearance distances understood and maintained for both access and work. Refer to the Energized Electrical Equipment Activity Hazard Analysis.
Crossing Fence Lines	Serious cuts and puncture wounds, slip trip and falls	Do not climb over fences or walls, use gate or passways. Install passways for work areas. Should going through wire fence be unavoidable the two man approach is required, one to hold the wire open while the other passes. Use of correct PPE including gloves.
Tools (power and hand) and Equipment	Electrocution, serious cuts and puncture wounds, loss of limbs or life, work stoppage	All tools and equipment shall be in good repair, grounded and connected into a ground fault protected circuit. Unplug power tools when not in use. Follow lock-out / tag-out procedures for electrical equipment service and non-use. Use of correct PPE including gloves.
Housekeeping	Serious cuts and puncture wounds, slip trip and falls	Maintain clear and orderiy work areas, access and exit ways. Properly store all tools and equipment. Refer to Housekeeping Activity Hazard Analysis.
Working Space or Areas, Confined Space	Explosion, fire, toxic environment, lack of Oxygen, severe burns, loss of life, possible cross contamination of work zones and clean areas	Complete evaluation of work space. A site specific Job Safety Analysis or Permit is to be completed prior to entry into potentially hazardous environments. Refer to other specific Activity Hazard Analysis.

Potential Activity Hazard Analysis

Housekeeping

Significant hazards are associated with poor housekeeping both at the site, equipment and in job trailers. Poor housekeeping contributes to slip, trip and fall injuries, increases the chances for a fire and other serious incidents. All site personnel are responsible for identifying and correcting housekeeping problems in their individual work areas.

Hazard	Potential injury or Loss	Actions to Prevent or Reduce Exposure
Trash, debris, clutter	Pain and injury ranging from minor to serious caused by slips, trips and falls.	Trash and debris are to be consolidated at an approved staging location and contained while awaiting transport or disposal. Tripping hazards should be identified and eliminated if possible. If elimination cannot be done, then the hazards should be clearly marked and guarded.
Sharp objects	Infections, scars, etc. caused by cuts or punctures	Tools and equipment should be properly stored when not in use with protective covers placed over sharp edges and ends. Remove all sharp objects from ground.
Trash fires	Loss of life, equipment, work stoppage	Flammable containers shall be stored in approved containers and cabinets. No hot materials shall be disposed of in any container except for safety containers specifically assigned for the task.
Other	Damage, loss and injuries	An end of shift routine should be developed which will allow for the proper storage of all tools, equipment and supplies.

Potential Activity Hazard Analysis
Adverse Weather

Adverse weather conditions can occur anywhere at virtually any time. Proximity to large bodies of water such as the Great Salt Lake and rivers or mountains, ridges, canyons and similar terrain can result in rapidly changing and intense weather conditions. The contractor's PSHO shall be charged with maintaining knowledge regarding forecast conditions that will impact the site and work operations.

Weather Condition	Potential Hazard or Concern	Action to Eliminate or Reduce Exposure
Sustained High Temperatures	Heat Stress Related Illnesses	Ensure that sufficient and appropriate fluids are available for consumption by workers. Initiate heat stress monitoring if warranted. Provide for adequate rest periods in sheltered areas.
Sustained Low Temperatures	Cold Stress Related Illnesses	Ensure that ali personnel are adequately clothed for the conditions. Monitor temperatures including wind chill. Monitor personnel closely for sign of illness. Provide adequate breaks in heated and sheltered environment.
High Wind	Eye injuries from windblown materials, falls from elevated positions, flying debris	Ensure all personnel are wearing appropriate safety glasses or other eye protection as necessary. Avoid having personnel work on or In elevated machinery or positions. Employ good housekeeping techniques to eliminate blowing debris. Special caution should be used involving the dumping of end dump trucks and trailers.
Heavy Rain	Reduced visibility and flash floods in low lying areas of the site. Loss of traction by wheeled vehicles. Unstable and/or slippery walking and working surfaces.	Instruct all personnel to reduce speeds when traveling in wet conditions. Vehicle traffic and foot traffic should be limited if possible. All personnel should be advised of potential flash flood locations on the site and work in these locations should be avoided If heavy rains are present or forecast.
Thunderstorms	Equipment and personnel being struck by lightning.	Avoid elevated positions. If thunderstonns are present, ground personnel should be retrieved and seek shelter until threat has passed. All equipment should be stopped and operators removed. The Field Supervisor shall be responsible for suspending operations and restarting operations during thunderstorm conditions. Generally, the 30-30 rule shall be used, which is: if thunder is heard within 30 seconds of seeing a lightning strike, work shall be halted for a period of 30 minutes.
Snow	Cold Stress Related illness, slippery conditions	Same as for Sustained Low Temperatures. Wheeled equipment traction is greatly reduced so care must be taken. All ground personnel should be closely monitored at all times.
Fog or Mist	Reduced visibility	Extreme caution should be exercised by equipment and vehicle operators. Ground personnel should not be placed in proximity to working equipment or traffic under reduced visibility conditions.

Potential Activity Hazard Analysis

Poisonous Plants

Hazard	Potential Injury or Illness	Actions to Prevent or Reduce Exposure
Contact with Poison Oak, Poison Ivy, Poison Sumac	Painful skin irritation, allergic reactions, death	Examine work area for poisonous plants. Notify workers of potential of poisonous plants, reassign allergic workers. Exercise caution when working in vegetated areas. Coveralls, gloves of leather or cotton will normally provide adequate protection from skin contact. Respiratory protection may be required, follow TSEA for this work. In known infested areas use equipment to handle plants. Persons who are exposed or believe they may have been exposed should report the episode to their supervisor.

Potential Activity Hazard Analysis

Poisonous Snakes and Animals

The concern for biological hazards must be determined on a task specific basis and addressed in individual job safety analysis (JSA) issued for these tasks. Prompt reporting and medical attention is required for bites/stings of any kind and exposure to poisonous wildlife with evidence of allergic reaction. Rodents may carry rabies or plague and a medical evaluation is required. The following tables should be used as a reference or guide when developing the work plans and JSAs.

Hazard	Potential Injury or Illness	Actions to Prevent or Reduce Exposure
Rattle Snakes	Snake bite	Personnel on foot should avoid brushy areas or areas with tali grass. Use extreme caution when moving materials which have been stored outside. Snakes are frequently found in rocky areas as well. Personnel shall wear boots at least to the ankle, long pants and long shirts on site.
Rodents	Rabies, plague, hanta-virus	Avoid contact with any type of rodent, dead or alive. Dead animal carcasses should be handled using universal precaution PPE (Impervious gloves, goggles, clothing and a respirator.) Avoid areas where rodent droppings are present and avoid stirring dust so that it becomes airborne. Employ Standard Operating Procedure for handling potential Hanta-Virus carrying materials or organisms.

Potential Activity Hazard Analysis

Insect Hazards

Hazard	Potential Injury or Illness	Actions to Prevent or Reduce Exposure
Spiders (Black Widows, Brown Recluse, other)	Painful bites, allergic reactions, death	Identify personnel with insect allergies and arrange for anti-inflammatory medication to be on-site. Exercise caution when moving materials. Gloves of leather or cotton will normally provide adequate protection from bites. Persons who are bitten or believe they may have been bitten should report the bite to the SH.
Scorpions	Painful stings, allergic reactions	Report to PSHO as soon as possible.
Bees, wasps, hornets, etc.	Extremely painful sting, severe allergic reactions in some persons.	Avoid disturbing nests, do not wear strong colognes, perfumes, etc. Bright colors may sometimes attract.
Horseflies, flies, gnats, mosquitoes, etc.	Sometimes painful stings, irritants	Utilize insect repellent commercially available.

Potential Activity Hazard Analysis

Water Safety

Hazard	Potential Injury or Illness	Actions to Prevent or Reduce Exposure
Loss of footing, falling in water.	Drowning, hypothermia, death	All work shall be completed 6 fl or more from water that is 3 ft deep or more or that have a subsurface that can trap entrant (ex deep mud). Watch footing around banks. Do not work on unstable bank. Should the work not meet this requirement a RA shall be performed and the work shall be in compliance with the BP Water Work Policy. This Policy is attached.

Job Risk Assessment - Pre Demo Assessments

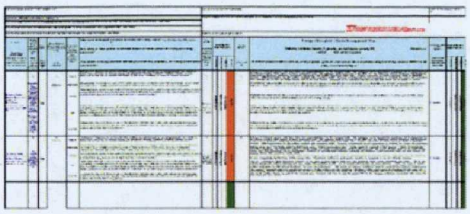
[illegible]

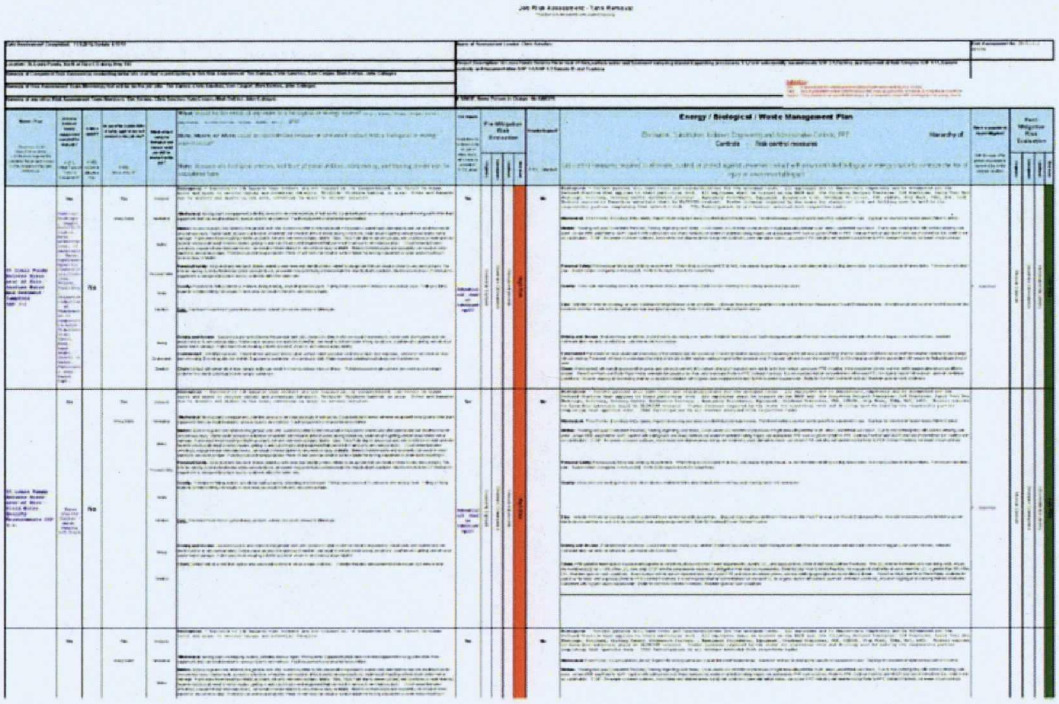
Work Plan	[illegible]	[illegible]	[illegible]	[illegible]	What would be the result of exposure to a biological or energy source? [illegible] and How, where, or when could an uncontrolled release or unwanted contact with a biological or energy source occur? Note: Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	[illegible]	Pre-Mitigation Risk Evaluation	[illegible]	Energy / Biological / Waste Management Plan. Elimination, Substitution, Isolation, Engineering and Administrative Controls, PPE. Hierarchy of Controls - Risk control measures. List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental impact.	[illegible]	Post-Mitigation Risk Evaluation
[illegible]	[illegible]	No	[illegible]	[illegible]	[illegible]	[illegible]	High Risk	[illegible]	[illegible]	[illegible]	Low Risk
Inspection of [illegible]	[illegible]	No	[illegible]	[illegible]	[illegible]	[illegible]	High Risk	[illegible]	[illegible]	[illegible]	Low Risk
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		

Job Risk Assessment - Pre Demo Assessments

[illegible]

Work Plan	[illegible]	[illegible]	[illegible]	[illegible]	What would be the result of exposure to a biological or energy source? [illegible] and How, where, or when could an uncontrolled release or unwanted contact with a biological or energy source occur? Note: Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	[illegible]	Pre-Mitigation Risk Evaluation	[illegible]	Energy / Biological / Waste Management Plan. Elimination, Substitution, Isolation, Engineering and Administrative Controls, PPE. Hierarchy of Controls - Risk control measures. List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental impact.	[illegible]	Post-Mitigation Risk Evaluation
Inspection of [illegible]	[illegible]	No	[illegible]	[illegible]	[illegible]	[illegible]	High Risk	[illegible]	[illegible]	[illegible]	[illegible]
Inspection of [illegible]	[illegible]	No	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low Risk

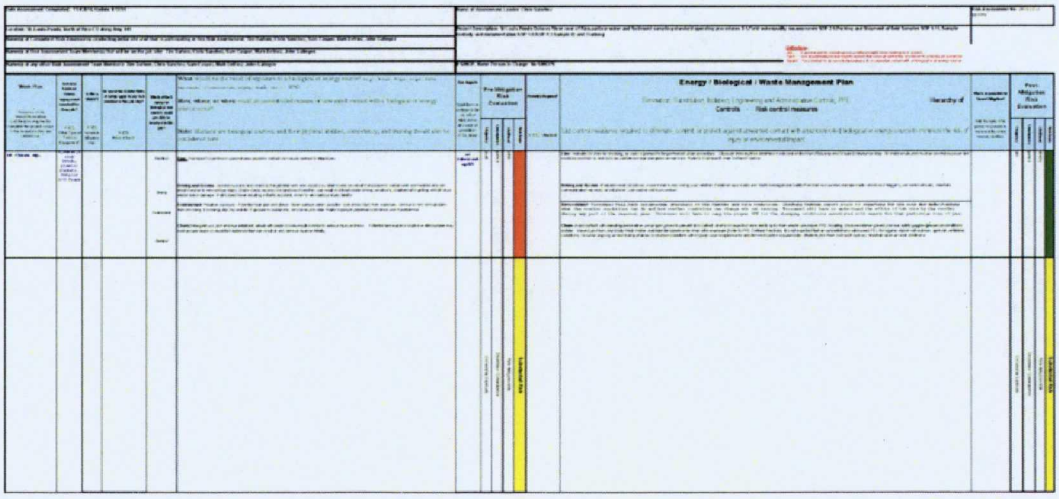




Job Risk Assessment - Tank Removal

Energy / Biological / Waste Management Plan

Hierarchy of Controls – Risk control measures



Job Risk Assessment - Tank Removal

Energy / Biological / Waste Management Plan

Hierarchy of Controls – Risk control measures

Site Risk Assessment

[illegible]

Date Assessment Completed: [illegible] Updated [illegible]	Name of Assessment Leader: Chris Sanchez
Location: St. Louis Ponds, North of Rico CO along Hwy 145	Project Description: Water Sampling and Flow Measurements of the Rico St. Louis Ponds area, Dolores River Near Rico CO
Name(s) of Competent Risk Assessor(s) conducting initial site visit that is participating in this Risk Assessment: Tim Barbes, Chris Sanchez, Sam Cooper, Mark Daffner, John Gallegos	
Name(s) of Risk Assessment Team Member(s) that will be on the job site: Tim Barbes, Chris Sanchez, Sam Cooper, Mark Daffner, John Gallegos	
Name(s) of any other Risk Assessment Team Members: Tim Barbes, Chris Sanchez, Sam Cooper, Mark Daffner, John Gallegos	F SMOP, Name Person in Charge: [illegible]

Risk Assessment No. [illegible]

[illegible]

Inherent Site Level Issues	[illegible]	[illegible]	**What** would be the result of exposure to a biological or energy source? [illegible] and **How, where, or when** could an uncontrolled release or unwanted contact with a biological or energy source occur? **Note:** Humans are biological sources, and their physical abilities, behaviors, competency, and training should also be considered here	Pre-Mitigation Risk Evaluation				Energy / Biological / Waste Management Plan — Elimination, Substitution, Isolation, Engineering and Administrative Controls, PPE — Hierarchy of Controls — Risk control measures	[illegible]	Post-Mitigation Risk Evaluation			
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rico Project - St Louis Ponds and Dolores River near of Rico	No	Yes [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High Risk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low Risk
Rico Project - St Louis Ponds Dolores River near of Rico- Weather	No	No	[illegible]	[illegible]	[illegible]	[illegible]	High Risk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low Risk
Rico Project - St Louis Ponds Dolores River near of Rico-Security	No	No	[illegible]	[illegible]	[illegible]	[illegible]	Low Risk	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low Risk

Health & Safety Plan
Rico Project

APPENDIX F

WORKING ON OR NEAR WATER POLICY

Foreword

This is the first issue of Site Technical Practice RM ____. It covers general requirements for design, construction and maintenance activities occurring adjacent to, or in, water bodies during conduct of remediation or on-shore decommissioning activities.

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1. Scope

a. This Guidance on Practice (GP) covers general requirements for design, construction and maintenance activities occurring adjacent to, or in, water bodies during conduct of remediation or on-shore decommissioning activities.

b. Work near water is primarily defined as that work which involves a potential danger of drowning. Evaluation as to whether work activities constitute a danger of drowning and hence the requirements of this guidance are applicable, will be done on a site-specific basis, as deemed appropriate, by the Basic Work Team (BWT) as part of Health and Safety Plan development. As a guide it is generally considered that work conducted within 6 feet of water that is more than 3 feet deep or has a soft bottom of sufficient thickness to become an entrapment hazard can pose a danger of drowning. Use of BP-approved fall protection systems (including guard rails between the work area and the water) may replace the need for personal flotation devices, rescue skiffs and other work near water health and safety procedure requirements identified in this GP.

c. This GP does not include requirements for offshore facilities.

d. This GP does not include a comprehensive listing of legislation, regulations, codes of practice and standards applicable to working around water bodies. The designer and/or constructor are responsible for ensuring that the latest recent versions of the appropriate codes of practice and standards relevant to the proposed location are used for design and construction around water. The Environmental Business Manager (EBM) or their designee oversees and verifies that the designer and/or constructor are qualified to determine appropriate standards and codes of practice. Experienced in-house individuals are available to provide technical support for the EBM in making this determination (see Table 1 for a listing of in-house technical support individuals).

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

Code of Federal Regulations (CFR)

18 CFR Part 12	Dam Safety Requirements.
29 CFR 1926.106	Working Over or Near Water.
29 CFR 1926.502 and 760	Fall Protection.
29 CFR 1926.502	Guardrails.
29 CFR 1926.1076-1085	Underwater Dive Requirements.
46 CFR Part 160	U.S. Coast Guard Standards for Approved Lifesaving Equipment.

Navy and Army Engineering Guidance

NAVFAC DM-7	Department of Navy; Design Manual for Soil Mechanics, Foundations and Earth Structures.
TM 5-818-5	USACE; Dewatering and Groundwater Control for Deep Excavations.
EM 385-1-1	USACE; Safety and Health Requirements.
EM 1110-2-1601	USACE; Hydraulic Design of Flood Control Channels.

EM 1110-2-1902	USACE: Soil Stability Analyses.
EM 1110-2-1906	USACE: Drilling and Sampling Techniques.
EM 1110-2-1908	USACE: Instrumentation of Embankment Dams and Levees.
EM 1110-2-1913	USACE: Design and Construction of Levees.
EM 1110-2-2300	USACE: Earth and Rock Filled Dams – General Design and Construction Considerations.
EM 1110-2-2502	USACE: Retaining and Flood Walls.
EM 1110-2-2902	USACE: Conduits, Culverts and Pipes.

3. Symbols and abbreviations

For the purpose of this OP, the following symbols and abbreviations apply:

SWT	Basic Work Team
CPR	Code of Federal Regulations
EBM	Environmental Business Manager
FHWA	Federal Highway Administration
FOS	Factor of Safety
GP	Guidance on Practice
MOC	Management of Change
NOAA	National Oceanic and Atmospheric Administration
PFD	Personal Flotation Devices
RM	Remediation Management
SOLAS	Safety of Life at Sea
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

4. Basic requirements

a. Where practicable, diverting and/or removing water from the work area prior to performing other construction activities is generally preferable to having to perform work in a sustained basis on, in, or near water. However, implementing water diversion/removal may itself temporarily expose workers or others to activities that represent a potential danger. Therefore, the relative hazards represented by implementing and maintaining water diversion/removal needs to be assessed and compared to the hazards of completing the planned work without water diversion/removal before a final decision is made. If the decision is to proceed with water diversion/removal activities that themselves may represent a potential danger of drowning, then the applicable regulatory, design, health and safety, construction, operations and maintenance, and emergency response procedures identified in Sections 3 through 13 of this guidance should be followed.

b. If diverting/removing water is impractical then appropriate testing, design, safety and emergency response planning should be completed in accordance with project specifications and applicable regulations and guidance prior to proceeding with work on, in, or near water.

c. Water diversion/removal systems should be kept as simple as possible in terms of construction, operation, and maintenance. Open gravity based water routing systems (i.e., ditches and dikes) are typically easier to maintain and therefore may be preferred where feasible for water management.

d. Design of water management systems shall be subject to BP approval typically by our EBSser their designee. Experienced in-house individuals are available to provide technical support for the EBM in reviewing water management systems designs (see Table 1 for a listing of in-house technical support individuals).

e. Conceptual design shall be approved by BP's EBM or their designee before detailed design.

5. Legislation and standards

a. Diversion/management of water shall be subject to approval of local authorities and subject to legislation within our country or state. Local, state and/or federal permits may be required.

b. If constructing or upgrading water management systems, consideration should be given to compliance with new and potential future standards.

c. If standards set by local authority, BP standards, and current legislation are different, the most stringent standard shall be adopted.

6. Design

6.1. General

a. Working adjacent to and/or within water should be considered in very early stages of design of remediation or decommissioning as part of initial alternative development and screening.

b. Working adjacent to and/or within water should be designed in accordance with locally recognized and accepted standards except as otherwise described below.

1. Standards shall be subject to review by BP's EBM or their designee to ensure any external standard includes requirements at least as stringent as BP's practices.

6.2. Integration with project process

Consideration should be given to integration of work activities into remediation and/or decommissioning of facilities.

6.3. Design factors

The following considerations should be assessed by designer in selection and planning of work activities adjacent to and/or within water bodies:

a. Alternate designs that eliminate activities in, on, or adjacent to water bodies.

b. Water depth/velocity.

c. Potential for changes in water depth/velocity due to flooding and/or tides.

d. Presence and thickness of ice.

e. Local geology/hydrogeology and in particular the potential presence of quicksand, deep mud, saturated sediment or related entrapment/stability hazards.

f. Local topography and bathymetry.

g. The stability of slopes and base materials, under, or adjacent to, bodies of water.

h. Site access limitations and constraints.

i. Presence of endangered species or other sensitive terrestrial and aquatic life.

j. Presence of wetlands or other protected resources potentially affected by water management changes.

k. Water quality.

l. Current and anticipated water uses and water rights.

m. Assessment of historical industrial activities that may have left currently disguised hazards.

n. Types of fill and construction methods.

6.4. Water Body Types

6.4.1. General

a. Potential water body types are described in Sections 6.4.2 through 6.4.4. Oceans and seas are specifically excluded.

b. Descriptions are a guide, and there are no distinct boundaries between categories.

c. Exact definitions shall depend on legislation available.

6.4.2. Rivers/Streams

a. Rivers and streams are flowing water bodies formed naturally by fluvial processes.

b. River/stream channel and floodplain properties (i.e., depth, width, etc.) are determined by basin conditions (including basin size, precipitation/runoff characteristics, slope, vegetation, land use, etc.) and typically vary spatially and temporally.

c. Apart from the limited control provided by dams, most river flows are unregulated and vary with precipitation and/or seasonal snow melt.

d. Water levels in rivers and streams can extend out of bank onto adjacent floodplains under higher flow conditions (i.e., over bankfull discharge levels which for natural streams are typically equivalent to about the 1.5 to 2.5 year return interval flood).

e. River/stream channel alignments follow natural topography and can move laterally and vertically over time in response to natural erosion and deposition processes. Disturbance of channel banks/bed and/or installation of structures that constrain flow can increase the potential for local erosion and/or increase backwater elevations.

f. Stream banks are subject to undercutting which can be difficult or impossible to detect at certain water levels, creating calving hazards near stream edges.

g. Due to natural particle size sorting provided by higher flow velocity conditions, river and stream channel beds are typically made up of coarser grained material (i.e., sand, gravel or cobbles) but fines-grained silts and clay material of lesser shear strength may accumulate in depositional areas such as point bars and backwater channels.

h. Additional regulatory and permit requirements may exist for work in, on, or near navigable waterways which include rivers and streams that have documentation of historical commercial use.

6.4.3. Natural or man-made ponds, lakes, reservoirs, sedimentation basins, or wetlands

a. Ponds, lakes, reservoirs, sedimentation basins and wetlands are typified by slow flowing or ponded water contained within certain geographic boundaries.

b. Water body properties (i.e., depth, width, etc.) are determined primarily by local topography, groundwater table elevation, direct precipitation/evaporation and the balance between surface water inputs and outputs as well as spillway elevations.

c. Extent of flooded area varies with changes in water level and sediment deposition.

d. Slow flow conditions make these water bodies primarily depositional environments, resulting in bottoms that are often made up of thick layers of fine grained, loosely consolidated silt and clay material with little sheer strength.

e. Additional regulatory and permit requirements exist for work in jurisdictional wetlands. Jurisdictional wetlands are defined by the 1987 USACE Manual as "Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas".

f. As-built documentation for older man-made impoundments cannot be presumed accurate as to current condition.

6.4.4. Drainage ditches, channels or canals

a. Drainage ditches, channels and canals are flowing water conveyance features formed by human excavation and/or berming.

b. Ditch/canal properties (i.e., depth, width, etc.) are determined by design requirements and are typically relatively uniform in shape and alignment.

c. Ditch/canal design often provides for some control of flow rate and/or routing.

d. Water levels in ditches and canals vary with flow levels but these structures are typically designed to prevent overflow at less than design flow levels.

e. Ditches and canals follow man-made topography and are typically protected from moving laterally using riprap or other erosion protection methods.

f. To maintain conveyance capacity, build-up of thick layers of fine-grained sediment on ditch/canal bottoms is typically prevented by bed slope design and/or through periodic ditch flushing or mechanical cleanout.

6.5. Options for Temporary Water Management during Construction

The primary options for water management during construction are to *divert/remove it* or appropriately plan for working on, in or near water. Table 2 summarizes the primary advantages and disadvantages of these two options.

6.5.1. Divert/Remove

a. Ability to implement this water management option is dependent on size of flow and/or storm event that the diversion/removal system needs to be designed for, diversion distance requirements, local topography and geology, impacts on terrestrial and aquatic life (particularly endangered species or other protected resources), seasonal considerations, and potential impacts to water quality or availability for current water users.

b. Design alternatives for diverting/removing water including type of diversion (i.e., ditches versus berms, pumping versus gravity drainage, etc.) and diversion layout/alignment should be evaluated early in the design process for cost-effectiveness, implementability and risks, to document that the most appropriate alternative is taken into detailed design

and to provide the lead time required to obtain any additional data required for the detailed design.

c. Appropriate health and safety, hydraulic/geotechnical/structural design, construction, operation and maintenance and emergency response considerations for implementing water diversion/removal are described below in Sections 7 through 13.

6.6.2. Working On, In or Near Water

a. Working on, in or near water needs to consider: water depth, temperature, potential for waves/currents and flow rates; presence of thin ice or soft bottom entrapment hazards; site access limitations; ground stability and weather. Potential seasonal and storm event variations in these conditions over the course of the planned construction period also need to be considered.

b. Appropriate health and safety, hydraulic/geotechnical/structural design, construction, operation and maintenance and emergency response considerations for working on, in or near water are described below in Sections 7 through 13.

7. Work Near Water Health and Safety Procedures

7.1. General

a. Communications – Personnel exposed to water-related hazards shall be provided with immediate access to emergency communications such as radio communications and/or cell phones.

b. Buddy System – The use of a buddy system should be maintained in areas with water-related hazards.

c. Additional Information – see 29 CFR 1910.106: Working Over or Near Water; 29 CFR 1926.760: Fall Protection; 29 CFR 1926.1076-1086: Underwater Dive Requirements; 46 CFR Part 160: U.S. Coast Guard Standards for Approved Lifesaving Equipment and EM 385-1-1: USACE Safety and Health Requirements.

7.2. Personnel Flotation Devices

7.2.1. Throwing Rings

a. Type IV Personal Flotation Devices (PFDs) are U.S. Coast Guard approved "ring life buoys" typically referred to as "life rings" or "throwing rings."

b. These devices are required for work near water.

c. The interval between rings shall not exceed 200 feet and/or throwing rings must be within 100 feet of work.

d. Maintain 90 feet of retrieval line attached to throwing rings.

e. These devices or equivalent length rescue throwing bags shall also be used where there are potential entrapment hazards such as bogs, lagoons, quicksands, or deep muds.

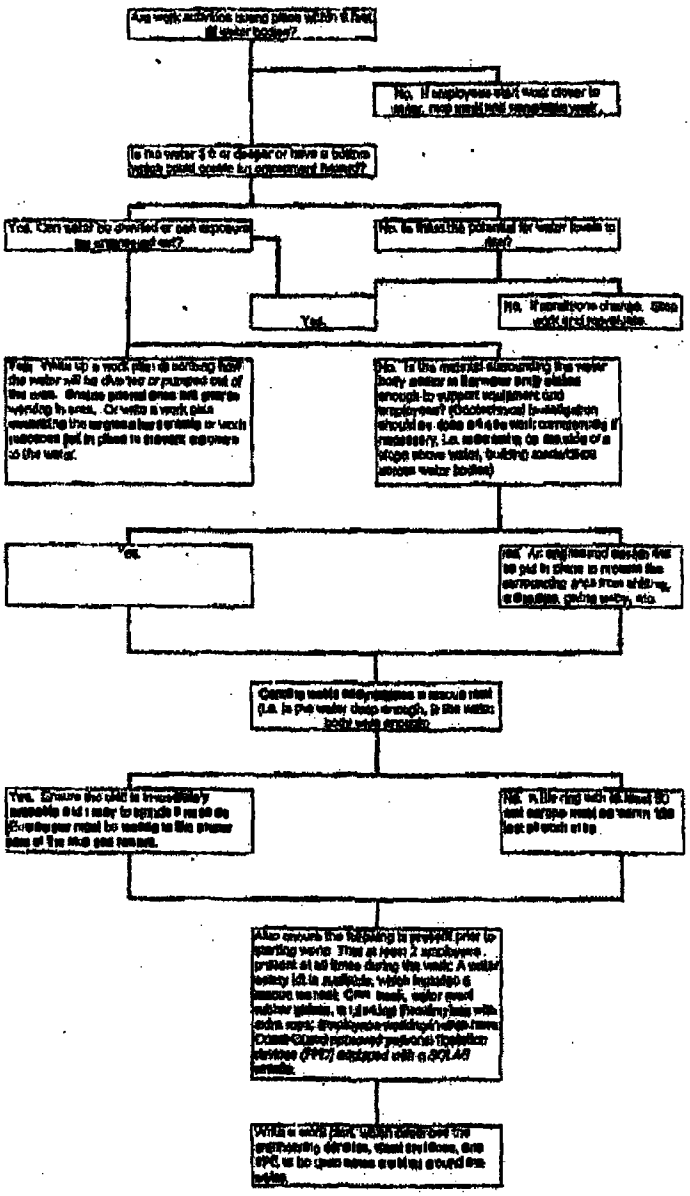
7.2.2. PFD Vests

a. Wear Coast Guard approved work vests and inspect work vests before each use.

b. Do not use recreational boating PFDs such as ski jackets for work applications.

c. PFDs used as work vests may be Type I, II, III, or V PFDs. A Type V PFD, including Type V Hybrid PFDs, is acceptable only if it is U.S. Coast Guard approved and marked for use as a work vest, for commercial use, or for use on commercial vessels.

Wearing Amarex Water Flow Chart



d. PFDs shall be fitted with a SOLAS (Safety of Life At Sea convention) compliant whistle or noise making device.

e. When work at night, PFDs shall have SOLAS rated reflective tape/materials affixed to the PFD.

f. Safety nets or similar fall protection or positioning devices may be used in place of PFDs.

g. The use of PFDs is generally NOT appropriate for submerged hazards such as deep muds.

h. In hypothermia conditions, PFDs should be insulated (e.g., "mustang suit").

7.3. Rescue Skiffs

a. Rescue skiffs should be used judiciously and may pose additional drowning risk for rescue personnel. Throwing rings or throwing bags should generally be used before launching a boat.

b. The skiff must be in the water or capable of being quickly launched by one person.

c. There must be at least one person present and specifically designated to respond to water emergencies and operate the skiff at all times when there are employees above water without an approved fall protection system in place.

1. When the operator is on break another operator must be designated to provide the required coverage while employees are above water.

2. The designated operator must either man the skiff at all times or remain in the immediate area such that the operator can quickly reach the skiff and get underway.

3. The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff and get underway.

4. If visual contact is not maintained by the skiff operator, a communication system, such as a walkie-talkie, must be in use to inform the skiff operator of an emergency and to inform the operator where the skiff is needed.

5. Skiff operators shall be qualified and shall operate the rescue skiff in a non-emergency situation before being qualified. The Coast Guard Auxiliary provides national boating safety courses. However, Coast Guard boating safety courses focus on power boating and may not include water rescue training. Therefore, private programs which include formal training on appropriate water rescue techniques may be the preferred option for qualifying skiff operators.

d. Equipment in the skiff:

1. At least one paddle, attached by lanyard to the skiff (or a fixed oar) shall be included in the skiff (regardless of whether the skiff is powered or unpowered).

2. At least one PFD for each rescue person.

3. At least one throwing dog or throwing bag.

e. Use of Skiff for Ice Rescue:

1. A flat bottom rescue skiff should also be used for rescue on thin ice.

2. Rescue personnel should stay in the boat and slide it over the top of thin ice.

3. Ropes from shore or stable ice may be used to help guide the boat.

7.4. Other Equipment Considerations

a. Selection of equipment used for work near or in water needs to consider the bearing capacity of the subgrade. Low ground pressure equipment and/or the use of mats may be required to spread equipment loads when working on soft soils or near unstable banks.

b. It is preferable to align equipment tracks/wheels perpendicular rather than parallel to the bank/shoreline when working near water to facilitate escape landward should the ground start to fail towards the water.

c. Systems or tools to facilitate operator self-extraction in the event the windlass and operator become engulfed in water should be considered for enclosed cab equipment working near water. Options include manufacturer installed pull-ring type escape windows along with various cab extraction tools. A standard "5-in-1" tool is available from a company called EMI that combines a window breaking tip, seatbelt cutter, whistle, air bag pin and flashlight. This tool has an orange plastic handle for visibility and is typically mounted in an acceptable location in the cab. Operators should be trained on use of whatever system or tool is used to familiarize themselves with the equipment.

7.5. Use of Fall Protection

a. In general, fall protection systems may be used in place of PPE vests and other work near water controls. Examples include guard rails, fall arrest systems, lifelines, harnesses or safety nets. Fall protection systems should comply with the applicable provision of 29 CFR 1926.502.

7.6. Excavations

a. Diversions ditches, dikes or other means shall be used to prevent surface water entering an excavation and to provide good drainage of the area adjacent to an excavation.

b. Personnel shall not work in excavations in which there is accumulated water or in which water is accumulating unless the water hazards posed by accumulation is controlled.

1. Pressing, pumping, drainage or similar control measures shall be planned and directed by a registered engineer.

2. When continuous operation of groundwater control equipment is necessary, an emergency power source shall be provided. Water control equipment and operations shall be monitored by a competent person to ensure proper operation.

7.7. Cofferdams

a. If overtopping of cofferdam by high water is possible, design shall include provisions for controlled flooding of the work area.

b. If personnel or equipment are required/permitted on cofferdams, standard railings or equivalent protection shall be provided.

c. At least two means of access shall be provided for personnel and equipment working on cofferdams.

d. A plan, including warning signals, for evacuation of personnel and equipment in case of emergency and for controlled flooding shall be developed and posted.

e. Cofferdams located close to navigable shipping channels shall be protected from vessels in transit.

8. Water Management System Hydraulic Design Requirements

8.1. General

a. Surface water can be raised and/or controlled using surface ditches, canals or channels; buried or surface pipes; and above-ground berms, dikes, levees and dams.

b. Depending on water velocities, riprap armoring or alternate erosion protection may be required on surface water management structures to control erosion.

c. Depending on water elevation and local topography, active pumping may be required to remove remaining surface water from the work area or groundwater from excavations.

8.2. Design Criteria

a. Design of water management structures needs to include determination of the applicable "design flow". Unless regulations require differently, the flow associated with the 10-year return interval, 24-hour precipitation event is typically used in the hydraulic analysis for sizing and determining erosion protection requirements for temporary surface water diversion/management systems. Larger flows, such as the 100-year flood, may be applicable for design of structures that will be in place long-term. Input data required for design flood hydraulic analysis is often available from the USGS (for river flows) or from the NOAA precipitation atlas (for storm event precipitation data). Computer programs are available for flood frequency (e.g., PEAKFQ from USGS); rainfall/runoff modelling (e.g., TR-55-Urban Hydrology for Small Watersheds from NRCS, HEC-HMS from USACE); hydraulics (e.g., HEC-RAS from USACE); culvert sizing (e.g., HY8 from FHWA) and riprap sizing (e.g., Riprap Design System from West Consultants).

b. Adequate freeboard must be provided for in the design to account for hydraulic analysis uncertainty. Typically a minimum of 1.0 feet of freeboard over design flood water levels should be allowed for in all hydraulic diversion and/or control structure designs.

c. See Engineering Technical Practices GP 04-10 Guidance on Practice for Drainage Systems for additional hydraulic design methods and requirements for surface water diversions and constructed channels.

d. See Engineering Technical Practice CET-AK-34-00 Guidance on Practice for Machinery for design methods and requirements for pumping systems.

9. Water Management System Geotechnical Design Requirements

9.1. General

a. Water management structures and facilities constructed in, on or near water are often in areas of weak soil and/or saturated soils making it beneficial that a geotechnical review by a competent engineer be completed to determine appropriate requirements for examining/addressing potential stability, settlement and seepage concerns during, and after, construction.

b. If the geotechnical review identifies potential stability or other concerns then appropriate investigation and analysis needs to be completed by, or under the oversight of, a competent engineer (see Section 8.2). A licensed professional geotechnical engineer (PE) or equivalent in the level of competency expected to complete or oversee investigation and design work where potential geotechnical stability concerns exist that could impact worker or public safety or infrastructure.

9.2. Geotechnical Investigation and Analysis Typical Requirements

If performed the geotechnical analysis will typically include:

a. Site investigation – involves determination of site subsurface conditions including stratigraphy, hydrogeology and the strength, permeability and consolidation characteristics of foundation and proposed structure fill materials. The required scope of the site investigation depends on the type and size of water management structures/systems planned and the known information on site conditions. For water diversion embankment structures such as levees, berms or dikes the site investigation would typically include:

1. Initial review of available geologic/hydrogeologic data including maps and air photos;
2. Completion of preliminary subsurface explorations to establish overall soil and groundwater profiles at the site and to provide a general idea of soil strength and permeability that can be used to help identify the preferred location, alignment and approximate section of the proposed embankment and borrow areas. Since on-site investigation work may require placing equipment and/or personnel on, in, or near water or soft bottom sediment areas, appropriate health and safety planning and geotechnical review of the field investigation plan needs to be completed prior to mobilization. Preliminary subsurface investigation may include screening exploration tools such as observation of the soil profile and, if present, groundwater levels in exposed banks and existing excavations, excavated test pits and/or borings. Cone penetrometer or geophysical surveys may also be used to obtain general information on the subsurface conditions. Testing of "disturbed" samples (e.g., test pit spoils, drill cuttings, remolded samples, etc.) as part of preliminary explorations can provide a general idea of subsurface material properties but are typically not usable for detailed geotechnical analysis of foundation materials.
3. Completion of final subsurface explorations along the proposed water management structure alignment and, if applicable, at borrow areas to provide additional information on soil and water profiles and on the specific strength, permeability and consolidation characteristics of "undisturbed" foundation and proposed borrow material samples. Undisturbed foundation material samples for testing can be obtained using thin-walled Shelby tube fixed piston samplers in most soils. Samples for laboratory analysis of consolidation, shear strength, density and permeability characteristics should be obtained using undisturbed borings in which 3-in or larger diameter samples are taken. USACE manual EM-1110-1-1906 provides additional details on appropriate drilling and sampling techniques for obtaining water diversion structure design data.

b. Geotechnical Analysis – involves determining, as applicable for the type of structure and site conditions, the expected stability, settlement and seepage of the proposed structure/facility design at various critical sections along the proposed alignment that have similar subsurface conditions, heights, slopes, and fill material types. If the analysis identifies potential concern or data gaps then further investigation and/or consideration of relocating the proposed structure or treating problem areas may be required. The required scope of geotechnical analysis depends on the type, size and locations of water management structures/systems planned and on the conditions but for water diversion embankment structures geotechnical analysis would typically include:

1. Stability Against Shear Failure:

a) Application - Overtopping a slope or foundation stratum adjacent to, or beneath, a water management system structure or load may cause: 1) sudden failure with rapid displacement (generating an immediate risk to the structure and any equipment/personnel on, or near, it); or 2) gradual shear strain (potentially damaging structures or improvements). The possibility of movement is evaluated by comparing forces resisting failure to those causing failure. The ratio between these forces is the factor of safety (FOS).

b) Form of Movement – Principal modes of failure are: 1) rotation on a curved surface approximated by a circular arc; 2) translation on a planar surface whose length is large compared to depth below ground; and 3) displacement of a wedge shaped mass adjacent to a yielding vertical surface. Analysis of FOS against rotational failure is applicable for structures placed on excavated or natural slopes (where slope stability is the primary concern) and for structures placed on relatively flat ground with soft foundation (where bearing capacity failure of

underlying soils is the primary concern). For non-uniform subsurface conditions, additional analyses of linear or wedge failure may also be required.

c) Evaluation Scenarios - The stability against shear failure analysis should consider the various loading, water table and other site conditions to which the embankment and its foundations may be subjected including: 1) during construction - which considers maximum loads provided by proposed construction equipment placed fill and, for finer grained soils, typically assumes undrained strength conditions below the water table saturation line to account for the inability to dissipate excess pore pressures when rapid loading by equipment and fill placement is applied to slow draining, saturated foundation soils; 2) long-term/full flood stage – which occurs when the water remains at, or near, full flood stage long enough that the embankment becomes saturated and a condition of steady state seepage occurs; 3) sudden drawdown – which represents the condition whereby a prolonged flood stage saturates at least part of the embankment and then falls faster than the soil can drain; and 4) earthquake – which, unlike for dams, is not normally considered for water diversion embankments because of the low probability of an earthquake coinciding with periods of high water (in depending on the importance of the embankment, location within a high earthquake risk zone, and presence of loose cohesionless material may be required for some embankments. Note that if the specific equipment to be used for construction, operation and maintenance of the system is unknown at this point in the design phase, the designer should assume the maximum equipment load that could reasonably be anticipated and note that the conservativeness of this assumption needs to be verified prior to initiating construction. Similarly, if the potential exists for variations in groundwater levels or change in groundwater slopes over time (due, for example, to erosion at the toe) then the analysis should use conservative input values for these parameters unless the potential for condition changes is controlled by design measures (such as toe scour protection).

d) Procedures - Various computer programs are available for these analyses (e.g., SLOPE/W, UTEXS, etc) so the effort of completing these analyses is greatly reduced allowing primary attention to be paid to the more important components of defining shear strengths, unit weights, embankment geometry, water levels, loading conditions and limits of possible sliding surfaces. While reasonably exact on parameter values, sensitivity analyses should be performed to verify acceptable performance under the range of possible site conditions and material properties.

e) Interpretation of Results - Evaluated results should be compared to minimum acceptable FOSs and if necessary the proposed design modified and re-evaluated to verify it meets acceptable levels. Minimum acceptable FOSs are dependent on type of structure/facility and condition being analyzed. The references identified in Section 2 provide minimum acceptable FOSs for various structure/conditions typically associated with EF's water management construction requirements. Minimum acceptable FOSs for levees identified by the USACE are 1.3 for during construction scenario, 1.4 for long term conditions, and 1.0 to 1.2 for rapid drawdown and earthquake scenarios. If minimum FOSs are not met, stabilization options such as: reducing applied loads by restricting equipment used, grading (to reduce slope heights/angles or remove/replace poor quality foundation material), subsurface drainage, engineered retaining structures, use of stabilized reinforcements such as geogrids, and/or surface drainage improvements can be evaluated or an alternate design change, such as relocating the structure or utilizing a different water management option, could be considered.

2. Settlement – Post-construction settlement of water management embankments may be important if it results in loss of freeboard or damage to the structure. Settlement analyses should be made where the potential for significant settlement exists, as under high embankment loads, embankments of highly compressible soil and embankments on compressible foundations. Where foundation and embankment soils are pervious or semi-pervious, most of the settlement will occur during construction. For pervious soils it is usually conservatively assumed that all the calculated settlement will occur after construction. Where analysis indicates that more foundation settlement would occur than can be tolerated, partial or complete removal of compressible material may be necessary from both stability and settlement viewpoints. When the depth of excavation required to accomplish this is too great for economical construction, other methods of control such as staged construction or vertical sand drains may have to be employed.

3. Seepage – Without control, underseepage in pervious foundations beneath water management embankments may result in: 1) excessive hydrostatic pressures beneath an impervious top stratum on the landside of the embankment; 2) sand boils; and 3) piping (i.e., internal erosion) beneath or within the levee itself. Uncontrolled seepage through the embankment that emerges on the land side can soften fine-grained fill in the vicinity of the landside toe, cause sloughing of the slope, or lead to piping of fine sand and silt materials. Besides potentially generating additional water management requirements on the land side of the embankment, under- and through-seepage can weaken the embankment and make it more susceptible to shear failure. Evaluation of the potential for seepage requires permeability information for the various materials making up the embankment and its foundation. Various computer programs are available for these analyses (e.g., SEEPAW, SEEP2D). If a potential for impacts from seepage is identified, seepage control measures should be evaluated for incorporation into the design. Principal seepage control measures include 1) cut-off trenches, 2) riverside impervious blankets, 3) landside seepage berms, 4) pervious toe trenches, 5) low permeability core, 6) high permeability core (chimney drain) connected to toe drains and 7) pressure relief wells.

10. Water Management System Structural Design Requirements

10.1. General

a. Appropriate structural design is required for water management system components that are constructed with concrete, steel, reinforced earth or other structural materials.

b. Structural design needs to consider the forces, pressures and moments that may be applied to the structure compared to the structure's total strength.

c. Structural design and analysis needs to be integrated with geotechnical and hydraulic analyses to ensure overall stability and performance of the system.

d. See Engineering Technical Practices _____ Guidance on _____ for structural design requirements and evaluations.

11. Construction and Workmanship

11.1. General

a. All construction activities in, on or near water should have adequate design packages completed before commencement of activity.

b. Design packages shall cover the details of construction and include verification that the appropriate hydraulic, geotechnical, structural and/or other applicable engineering analyses associated with the proposed construction were completed, checked and approved.

c. Design plans and specifications must clearly identify the required locations, dimensions, and material properties of the water management system components as well as allowable tolerances, if any, on these requirements.

d. To the degree possible, construction operations should be timed and sequenced to minimise the risks associated with working in, on or near water.

e. Water management systems that rely on active pumping to maintain a water-free work area should include either a backup pumping/power supply system for emergencies or include an early alert capability that provides sufficient warning time to safely remove personnel and equipment from the work area in the event of a pump and/or power system actual or imminent failure.

f. Water management systems that rely on surface diversions, gravity drainage etc. should be regularly inspected for integrity and if subject to seasonal/event flows, inspection should be triggered by such events.

g. Project health, safety and environmental reviews of applicable health and safety plans/analyses should be completed prior to initiating work on, in or near water to ensure that all known risks have been identified and adequately addressed and that management of change (MOC) systems are in place to address unknown risks and/or changes in conditions.

h. Changes to the design or the assumed conditions on which the design was based need to undergo a formal MOC process that is signed off by the appropriate Engineering Authority. The process needs to be robust in identification of changing or new hazards brought on by the changes and should include the competent engineer(s) in responsible charge of the original design.

11.2. Materials

a. Materials used for water management system construction must match or exceed the performance specifications of the materials evaluated/determined to be acceptable in the design analyses.

b. Material should have sufficient mechanical strength to support loads that it is required to carry in conjunction with designed backfill. Aggressive conditions in soil and potential movements of underlying soil or the water management structure itself shall be taken into account in material selection.

c. Material, if subject to long-term loading, such as buried pipe work, should not be subject to creep.

d. Water conveyance systems such as piping should, if possible, possess some flexible properties, either inherently or by virtue of its jointing system. If joints are used, joint integrity should be maintained for the design life of water management structure or for as long as directed by BP and the jointing materials should have resistance to specified chemicals and physical conditions at least equal to that of materials being joined.

e. Degree of overall integrity of water management structure should be established and the method of proving its continuing integrity should be identified.

11.3. Installation

a. Water management systems shall be constructed and installed in accordance with the "approved for construction" plans and specifications.

11.4. Oversight and Testing

a. Appropriate oversight and testing should be completed during construction and other activities to ensure: 1) site conditions are consistent with those assumed in design evaluations; 2) structures and facilities are constructed to correct lines and grades; 3)

material properties meet or exceed design specifications; 4) methods of construction are appropriate for a saturated environment; and 5) fill placement/compaction method achieves density and moisture content specifications. Of particular importance for earthen structures constructed into or through water bodies, is during construction monitoring of the quantity of fill placed versus design estimates. Use of greater than anticipated fill quantities may suggest loss of fill into a soft subgrade or deep water areas potentially indicating an increased risk of structural failure during or after construction.

b. BP personnel need to be kept informed of oversight and testing results, and in particular any changes in conditions, in a timely manner.

12. Operations and maintenance

12.1. General

a. Regular inspection and maintenance is essential to operation of most water management systems.

b. Specific inspection, operation and maintenance procedures should be identified in a formal plan that includes, as a minimum, inspection layout drawings, checklists and schedules. Inspection schedules should include contingencies for additional inspections before and after floods or other unusual events.

c. Inspection and maintenance logs should be maintained throughout the operation and maintenance period.

12.2. Inspection

a. Inspection requirements vary with the type of water management system and site conditions.

b. Inspection procedures for surface channels and surface or buried pipelines are identified in GP 04-10.

c. Typical inspection procedures for other water management systems include: 1) visual inspection for changes in seepage, cracking, piping, erosion or other signs of structural deterioration; 2) surveying for settlement, deformation, creep or other vertical or horizontal movement; and 3) monitoring for changes in surface or groundwater flow rates, levels, pressures or quality.

12.3. Rehabilitation

a. Once the requirement for diverting/removing or working within water is complete, the site should be returned to original conditions or, if this is impracticable, impacts to previous site uses/environmental qualities should be mitigated.

b. If returning the site to original conditions or mitigating impacts requires additional work in, on or near water, then appropriate alternative screening, design analysis, health and safety planning, and construction oversight as identified above should be performed to ensure the rehabilitation work is completed safely and effectively.

13. Emergency Response Considerations

13.1. General

a. If the work is defined as work in, on or near water which involves the risk of drowning (as determined using the methodology identified in Section 1b of this GP) then the following emergency response considerations apply:

1. All personnel working in, on or near water should have appropriate training and be familiar with emergency response procedures and contacts. Continuous oversight and/or the buddy system need to be used when personnel are working in, on or near water.
2. When working in, on or near water, the applicable emergency gear identified in Section 7 (i.e., throw rings, PFDs, skiffs) needs to be available on-site at all times.
3. Deep water, fast flowing water, cold water and/or presence of thin ice can present additional constraints to emergency response. Divers, or other specialized responders, may need to be alerted and their availability verified prior to proceeding with work in, on or near water under these conditions.

Table 1 In-house Technical Support Resources

Name	Expertise	Contact Information
add or provide fill		

Table 2 Water Management During Construction Options Evaluation

Construction Activity Type	Advantages	Disadvantages
Diversions in Water	Limits work activities around water primarily to the initial activities required to divert/remove water and the final activities associated with returning site hydrology to original conditions. Flowing work is isolated from water allowing it to be completed more efficiently and safely and reducing the potential for water quality impacts due to disturbance, spills, etc.	Diverting/removing water may increase overall costs, extend the schedule, cause additional environmental impacts that may be difficult to mitigate, and require significant operation and maintenance to ensure performance. Flood events larger than the design capacity of the diversion/removal system may still result in the need to stop work at the construction site.
Work in Saturated Conditions	Saves the costs and environmental impacts associated with removing/diverting water during field activities.	Working in saturated conditions negatively impacts productivity and safety. Operations are more exposed to changes in conditions from flooding, etc. that could negatively impact costs, schedules, and the environment with little ability to control or mitigate these impacts.